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In vitro REGENERATION AND CALLUS INDUCTION OF *Oryza sativa* L. Var. MRIA 1

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AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This dissertation has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

A study was conducted to determine the effects of different plant regulators (PGR) towards *in vitro* regeneration and callus induction of new Malaysian rice variety of *Oryza sativa* L. var. MRIA 1. Internode explants of 4-week old of aseptic seedlings were selected for *in vitro* regeneration and a total of 16 types of different combinations of NAA, IBA, BAP, and Kn were utilised. The most suitable plant growth regulators (PGR) for regeneration of *Oryza sativa* L. var. MRIA 1 was obtained from MS (Murashige and Skoog) media supplemented with 1.0 mg/L NAA and 0.5 mg/L Kn with an average of 8.90 ± 1.79 number of shoots per explant, 114.00 ± 18.90 number of roots per explant, 10.70 ± 2.62 cm length of shoots per explant and 8.70 ± 1.64 number of leaves per explant. The effect of combination of different plant growth regulators (PGR) supplemented in culture media on dry weight of regenerated *Oryza sativa* L. var. MRIA 1 were determined. Highest fresh weight (4.35±1.57 g) and dry weight (0.44±0.11 g per explant) recorded on the MS media supplemented with 1.0 mg/L NAA and 0.5 mg/L Kn. The callus inductions were assessed from three different explants including root, internode, and leaf base. The findings showed that the addition of 1.0 mg/L BAP into MS media was the most suitable for callus induction from root explant since it yield the highest fresh weight (1.039 ± 0.935 g per explant) and dry weight (0.093 ± 0.065 g per explant). The findings provided and optimum plant growth regulators (PGR) concentration for the tissue culture sysytem of *Oryza sativa* L. var. MRIA 1. Acclimatization of regenerated *Oryza sativa* L. var. MRIA 1 is recommended in order to serve a complete *in vitro* regeneration protocol of *Oryza sativa* L. var. MRIA 1.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF STUDY

Rice has been established as an important crop since many decades before and the improvements of this crop has getting a tremendous attention due to the demand of this crop is getting higher from day to day. This is due to the increasing in the world populations. In Asia, the rice demand was expected to increase by 70% up to the next 30 years due to the changes in population which eventually require all the rice production must be at least 3% per year (Alam, Imran, Hassan, Rubel and Shamsuddoha, 2012).

Many efforts have been done recently in order to improve the agronomic traits of rice through biotechnological techniques (Wang, Taketa, Miyao, Hirochika, and Ichii, 2006). It is due to the rice improved by biotechnology have many advantages such as it is resistance towards geographical and seasonal destruction, produced in high yield and have good quality in terms of nutrition. Besides, the unique quality exhibits by the rice plant has been able to make it become the most common crop used in monocots plant studies. However, the successful rice transformation program and monocots studies require appropriate and reproducible cultivars that available throughout the years. Owing to the fact that rice is an important monocots model in transformation system, plant tissue culture technique has been applied on rice as it ensures the continuous supply of rice within Asean countries. Through this technique, the organ and parts of rice plant are exploit and micropropagate *in vitro*. Plant tissue culture involving the callus regeneration in rice *Oryza sativa* L. has been reported in recent years. Previous studies that have been successfully established include the induction of embryogenic callus, micropropagation in liquid medium, as well as plantlet production through *in vitro* regeneration (Liu, Moon, Honda, and Kobayashi, 2001a). To date, the International Rice Research Institute (IRRI) use tissue culture technique to develop rice varieties (Alam *et al.*, 2012). As a result, many new varieties that exhibit different genotype and phenotype response have been produced.