# UNIVERSITI TEKNOLOGI MARA

# MICROPROPAGATION AND CALLUS INDUCTION OF RICE (*Oryza sativa* L.) VARIETIES MR 219 AND MR 253

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# ABSTRACT

Two local Malaysian rice varieties, MR 219 and MR 253 were examined for their *in vitro* regeneration and callus induction responses using mature seeds, leaf disc, stem, internode and root sections obtained from *in vitro* seedlings. After 4 weeks of culture, the optimum *in vitro* regeneration of MR 219 (100%) and MR 253 (100%) were recorded from internode explant cultured on MS media supplemented with 2.0 mg/L BAP and 0.05 mg/L NAA and MS media supplemented with 1.0 mg/L BAP and 0.5 mg/L NAA respectively. Other explants failed to regenerate *in vitro*. In general, rice variety MR 253 showed better *in vitro* regeneration than MR 219. Callus growth from seed, stem, internode and root explants became visible after 1–2 weeks being cultured on MS medium supplemented with various concentrations of 2,4-D. The highest callus induction frequencies for MR 219 (100%) and MR 253 (100%) were both obtained from rice seed explant cultured on MS media with 1.5 mg/L 2,4-D. Based on the overall result obtained, rice variety MR 219 gave better callus induction response than MR 253 in terms of callus induction frequency, size and the morphological characteristic of calli induced. Plantlets of MR 219 and MR 253 were successfully acclimatized and transferred onto different planting media. The highest rate of plantlet survival of MR 219 (100%) and MR 253 (60%) during acclimatization was recorded on the mixture of cocoa peat vermiculite and cocoa peat zeolite planting media respectively.

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# TABLE OF CONTENTS

# CHAPTER ONE
# INTRODUCTION

## 1.1 BACKGROUND OF RESEARCH

Rice popularity is widely recognized as one of the most important food crops in the world. This is due to the fact that rice is the staple food for half of the world's population. Each year, demands for improved and high quality rice are increasing. Thus, to satisfy the demands, biotechnological efforts has become significant. By plant tissue culture means, which is a tool in plant biotechnology, rice improvement is realized. Efficient callus induction and *in vitro* regeneration under controlled environment would determine the competency of plant tissue culture methods as a noble effort in rice industry development.

Micropropagation of rice is also an important step of any genetic transformation and improvement protocol because it provides sources of starting materials that can be used in genetic studies for crop improvement. Throughout the world, many rice micropropagation efforts have been established using various explants such as callus (Liu *et al.*, 2001), coleoptile (Sahrawat and Suresh, 2001), anther, panicle, young embryo (Wang *et al.*, 2005), roots (Zainah and Keng, 2010), seeds, leaf base (Afrasiab and Jafar, 2011) and stem (Joyia and Khan, 2012). The importance of plant growth regulators (PGRs), mainly cytokinins and auxins in micropropagation studies was also widely discussed for a long time.

A proper manipulation and determination of plant growth regulators in plant tissue culture can induce embryogenesis, organogenesis and rhizogenesis of plant tissues by varying the cytokinin-to-auxin ratio in the culture medium. The present study was carried out with the aim of establishing a micropropagation protocol for two local Malaysian rice varieties MR 219 and MR 253, in which mature rice seed, leaf disc, stem, internode and root segments were used as explants. A micropropagation method using simplified culture medium supplemented with various plant growth regulators was demonstrated aiming to obtain callus induction and *in vitro* regeneration of *Oryza sativa* varieties MR 219 and MR 253.