

UNIVERSITI TEKNOLOGI MARA

**ENHANCED PRODUCTION OF
PINOSTROBIN CONTENT AND
ADVENTITIOUS ROOT BIOMASS IN
*Boesenbergia rotunda***

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ABSTRACT

Currently, the market demand for high value plant based-ingredient for pharmaceuticals, food supplement, and cosmetic products are increasing. However, the amount and quality of bioactive compounds in field-grown plants is limited for industrial business because it is greatly influenced by environmental factors and harvesting time. Therefore, tissue culture or *in vitro* culture technique is considered as the most popular alternative to produce a stable and large amount of biomass and bioactive compounds. Adventitious root culture was chosen for *Boesenbergia rotunda* species because of its fast growth. To develop the initiation protocol of adventitious root culture of *B. rotunda*, the buds were surface sterilized using different concentrations and durations of treatment with commercial bleach (Clorox®). T3 was found to be the best surface sterilization protocol of *B. rotunda* by producing high number of non-contaminated and survived explants. The effect of MS strength, sucrose concentration, and inoculum weight were tested to enhance the biomass and pinostrobin content in adventitious root culture of *B. rotunda*. Result obtained showed that the biomass of adventitious roots were increased in 0.5 MS strength, 5% (w/v) sucrose concentration and 1.5 g FW inoculum weight, whereas the accumulation of pinostrobin content was enhanced in 0.5 MS strength, 5% (w/v) sucrose concentration and 1.0 g FW inoculum weight, respectively. These results showed that the type of culture conditions had strongly affected the production of *in vitro* adventitious roots biomass and pinostrobin content of *B. rotunda*.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Boesenbergia rotunda or commonly known as Chinese keys or Fingerroot in English, “Temu Kunci” in Malay and Krachai-Dang in Thailand is one of the famous tropical herb plants belonging to Zingiberaceae family (Burkill, 1935). It is originated from India and South-East Asia such as Indonesia, Malaysia and Thailand (Saralamp *et al.*, 1996). It is commonly known as fingerroot due to its unique structure where several tubers come out with a similar point resembling fingers of a hand from the central rhizome (Burkill, 1935).

This plant is well known for its pharmacological importance and also as a food ingredient in many Asian dishes due to its fragrant taste, which promote appetite. It is traditionally used to treat diseases for instance, muscle pain, rheumatism, gout, febrifuge, flatulence, gastrointestinal disorders, stomach ache, carminative, peptic ulcer, and dyspepsia (Burkill, 1935; Chaudhury and Rafei, 2001; Morikawa *et al.*, 2008). The rhizome extract has been reported to be used as poison. Malays used these plant to treat thyphoid fever, chest swelling, tinea infection, and a few gynaecological diseases such as ovary inflammation and for women during confinement (Burkill, 1935, Norhayati *et al.*, 1999). By scientific investigation, it has been proven that secondary metabolites extracted from the rhizome of *B. rotunda* exhibited great potential pharmaceutical application. For instance, the major bioactive compound that extracted from the rhizome of *B. rotunda* known as pinostrobin has possessed several function, including to increase the activity of antioxidant enzyme and quinone reductase (Fahey & Stephenson, 2002), exhibited anti-*Helicobacter pylori* activity (Bhamarapavati *et al.*, 2006), anti-leukemia activity (Sukari *et al.*, 2007), anti-HIV activity (Tewtrakul *et al.*, 2003) anti-aromatase activity (Le Bail *et al.*, 2000) and anti-mutagenic activity (Trakoontivakorn *et al.*, 2001).

Despite the potential pharmacological usage of *B. rotunda*, several limiting factors of its production remain to be a major challenge. Traditionally, this plant is cultivated by vegetative techniques using a rhizome segment (Yusuf *et al.*, 2011a).