

PLANT HAIRY ROOT CULTURE: A PROMISING SYSTEM TO PRODUCE SECONDARY METABOLITE

Yosephine Sri Wulan Manuhara

Department of Biology, Faculty of Science and Technology
Airlangga University, Surabaya, Indonesia

ABSTRACT

Many plant secondary metabolites of interest are accumulated in roots. Harvesting roots is destructive for the plants and hence there has been increasing interest in developing hairy root cultures from several medicinal plant species. Hairy roots can be produced by transformation with the soil bacterium *Agrobacterium rhizogenes*, resulting in the so-called hairy roots disease. Hairy roots are induced when a plant is infected by an *A. rhizogenes*, by a part of a root inducing (Ri) plasmid in bacteria, called transfer DNA (T-DNA), which is transferred into the plant cell and expressed therein. The interest in hairy roots is mainly due to their ability to grow fast without needing an external supply of auxins. Many times, they do not need incubation under light. They are fairly well stable in metabolite yield due to their genetic stability. Several hairy roots have been put to scale-up studies in bioreactors. The use of bioreactor in micropropagation revealed its commercial applicability, and recently gained attention to commercial micropropagation process and also to produce valuable metabolite from plant. So, the hairy root cultures in bioreactor have opportunity to developing in the future, because many experiments on hairy root culture that produce valuable secondary metabolite have already established.

Keywords: hairy root, secondary metabolite, *Agrobacterium rhizogenes*

Introduction

Plants synthesize a wide range of secondary metabolites such as alkaloids, anthocyanins, flavonoids, quinins, lignans, steroids, and terpenoids, which play a major role in the adaptation of plants to their environment. The secondary metabolites have been used as food additives, drugs, dyes, flavours, fragrances, and insecticides. Such chemicals are extracted and purified from naturally grown plants. However, production of secondary metabolites from plants is not always satisfactory. It is often restricted to a limited species or genus, and geographically to a specific region. Many important medicinal plants were endangered by overexploitation. Some plants are difficult to cultivate and grow very slowly or are endangered in their natural habitats. The biotechnological approach by utilizing plant cell and organ culture system can offer an opportunity to produce the secondary metabolites. However, there are many problems in the production of metabolites by plant cell and organ