names 2015

INTERNATIONAL CONFERENCE

On Natural Mathematical and Environmental Sciences
For Sustainable Development

9-11th OCTOBER

PROCEEDINGS

ISSN: 2461-0968

Direct Adventitious Shoot Formation from Tomato Hypocotyls and Cotyledons

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ABSTRACT

Tomato is consumed by people worldwide as a vegetable or fruit. The improvement of tomato plants through genetic transformation is very important, namely to produce a virus-free tomato stocks. One of the proofs that shows the success in the genetic transformation is the favorable outcome on its regeneration. This experiment aimed to find the methods of direct organogenesis from hypocotyl and cotyledon explants of tomato. Tomato seeds were germinated in agar medium with 1 ppm BAP. After two weeks, the hypocotyls and cotyledons were transferred to MS medium with 0.1 ppm TDZ in combination with 1-3 ppm BAP. The results were observed after four weeks of incubation. As many as 25% of adventitious shoots were formed from hypocotyl explants cultured on MS medium supplemented with 0.1 ppm TDZ in combination with 3 ppm BAP. While in cotyledon explants, 62.5% of adventitious shoots successfully formed in MS medium enriched with 0.1 ppm TDZ in combination with 1 ppm BAP.

***Key words**: tomato, direct organogenesis, adventitious shoots, TDZ, BAP*
Abbreviations : TDZ: Thidiazuron; BAP: 6-Benzylaminopurine

INTRODUCTION

As one of the horticultural crops, tomato is very popular around the world. Almost all of the people worldwide consume it in every day of their lives as vegetable,fruit, orsauce/dressing. That is why, tomato breeding plays an important role for the economicgrowth.Nonetheless, some of its unfavorable characteristics (i.e. susceptibility to diseases, rapid ripening, susceptibility to abiotic stresses, etc.) hamper the farmer to produce money from this plant. To overcome the problems, tomato improvements is required.

In order to improve the economic value of tomato, many attempts have been done. Namely, to make disease-resistance plants (Kong et al., 2014), to control the fruit ripening (Pech et al, 2008), or to increase the tolerance to abiotic stress such as drought (Nir et al, 2014). Those improvements are usually obtained through genetic transformation method. Transgenic cells that are producedvia genetic transformation process need to be regenerated into a whole plant so that they can function for human beings. Developing the best regeneration method is another challenging work because not every species sensitive to treatments that has been successfully applied to a certain species.

There are two pathways in plant cell regeneration, i.e. organogenesis and embryogenesis. These two pathways can be obtained directly from the cells (direct) or through callus formation (indirect). Direct organogenesis, the regeneration of plant directly from the cells, is favorable if we want to keep the purity of the genome. Many scientists have reported their studies on tomato via direct organogenesis pathway. In 2014, Wayase and Shitole successfully obtained multiple shoots from cotyledon and hypocotyl from tomato cv. Dhanashri by using MS medium supplemented with 6.65 µM BAP and 1.14 µM IAA. Previously, Jehan and Hassanein (2013) reported their findings on tomato regeneration from nodal segments using MS medium with 1-2.5 ppm BAP alone or in combination with 0.5 ppm NAA. From another study, it was also reported that MS medium enriched with 0.1 ppm IAA and 2 ppm Zeatin could induce multiple adventitious shoots from leaf fragments of tomato cv. Micro-Msk (Mamidala and Nanna, 2009).