

Effects of Oxygen on Cell Growth and Ginsenosides Production In Bioreactor Cultures of Mountain Ginseng (*Panax ginseng* C.A. Meyer)

Thanh N. T., Yu K.W., Hahn E. J. and Paek K. Y.

Research Centre for the Development of Advanced Horticultural Technology,
Chungbuk Natinal University, Cheongju 361-763, Korea

Introduction

Panax ginseng, commonly known as ginseng, is one of the most valuable herbs which belong to the family Araliaceae. Ginseng saponins (ginsenosides) are known as its major bioactive metabolites. Ginsenosides, for example are attributed to cardio-protective, immunomodulatory, anti-fatigue, and hepato-protective physiological and pharmacological effects.

Objectives

Oxygen is known to be important in aerobic microbial fermentations. In plant cell and tissue cultures, oxygen has affected cell proliferation and differentiation of somatic embryos. For secondary metabolite production in plant cells, oxygen of 0.3 atm was beneficial to cell growth and L-DOPA (3,4-dihydroxyphenylalanine) production in cell cultures of *Stizolobium hassjoo*; whereas higher oxygen were found inhibitory. However, there are no published studies of the effects of oxygen on cell growth and metabolite production in ginseng species. In this study, the effects of oxygen on the cell growth and accumulation of ginseng saponin by suspension culture of *P. ginseng* were studied in bioreactor culture.

Materials and Methods

1. Materials: Suspension cells of *P. ginseng* were grown in Murashige and Skoog (MS) medium.
2. Methods: Surface sterilization of ginseng root, callus induction, bioreactor culture, different volume of O₂ (30%, 40%, and 50%) supplied in bioreactor culture. Measurement of SOUR, DO, biomass yield and ginsenosides was also investigated.

Results and Discussion

Oxygen concentration of 40% was found optimal for the production of cell biomass by dry weight basis (12.8 g/L) and saponin content (4.5 mg/g DW). A low O₂ was unfavorable to the cell culture due to oxygen limitation. High O₂ inhibited cell growth and reduced the production of saponin content (2.55 mg/g DW) on day 20.

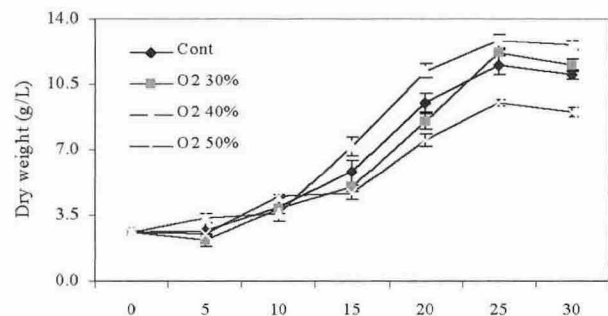


Fig. Growth kinetics of cell dry weight in bioreactor culture at different oxygen concentration