

ABSTRACT

Lead (Pb^{2+}) is a toxic heavy metal causes oxidative stress that affect vital organs in the body such as kidneys. Pb^{2+} induces formation of free radicals on cells, generation of reactive oxygen species (ROS), *reactive nitrogen species* (RNS), and decreases level of endogenous antioxidant defense mechanism. Oxidative stress triggers synthesis of heat shock protein (HSP) as sublethal response. The imbalance level of oxidant and antioxidant defense mechanisms has been suggested to play an important role in cells death. Administration of exogenous antioxidant from plant such as liverwort (*Marchantia polymorpha* L.) assumed can decrease free radical levels caused by heavy metal. The objective of this study was to investigate antioxidant activity of liverwort, to investigate whether methanol extract of liverwort (*Marchantia polymorpha*) will affect HSP70 expression and NO production in base-line levels on HEK293 (*human embryonic kidney*) cell line. HEK293 was cultured in DMEM (Dulbacco's Modified Eagle's Medium) for 24 h then divided into 6 groups: untreated as negative control, antioxidant control (Vitamin C), positive control (10 $\mu\text{g/mL}$ of lead nitrate only for 24 h), and treatments (10 $\mu\text{g/mL}$ of lead nitrate for 24 h then added by liverwort extract with several dose: 10, 30, 60 and 90 $\mu\text{g/mL}$ for 24 h to determine cell viability and NO production; and 5, 10 and 30 $\mu\text{g/mL}$ to determine HSP70 expression). The result showed that the activity of antioxidant scavenger of liverwort was about 5.22 $\mu\text{g/mL}$ of IC_{50} value. In addition, liverwort extract can increase cell viability and decrease NO production between $Pb(NO_3)_2$ group and others group and statistically showed significant value between them and also decrease HSP70 expression attained to base-line level.

Keywords: *Marchantia polymorpha*, oxidative stress, HEK293 cell line, antioxidant, HSP70

INTISARI

Timbal adalah salah satu logam berat penyebab oksidatif stress terutama pada organ vital seperti ginjal. Sel yang terpapar timbal akan membentuk radikal bebas, generasi *reactive oxygen species* (ROS), *reactive nitrogen species* (RNS), dan menurunkan antioksidan alami sel. Sel akan mensintesis *heat shock protein* (HSP) sebagai respon subletal terhadap stress oksidatif sel. Ketidakseimbangan oksidan dan antioksidan di dalam sel akan memicu apoptosis. Pemberian antioksidan eksogen dari lumut hati (*Marchantia polymorpha* L.) dapat menurunkan radikal bebas yang disebabkan oleh logam berat. Penelitian ini bertujuan untuk mengetahui pengaruh ekstrak metanol lumut hati terhadap aktivitas antioksidan, ekspresi HSP70 dan kadar NO sel HEK293 (*human embryonic kidney*) yang terbentuk dengan induksi timbal. Sel HEK293 dikultur pada medium DMEM selama 24 jam kemudian dibagi ke dalam 6 kelompok yaitu kontrol negatif tanpa perlakuan, kontrol positif (10 µg/mL timbal nitrat selama 24 jam), kontrol antioksidan (vitamin C), dan beberapa seri konsentrasi ekstrak lumut hati (10 µg/mL timbal nitrat selama 24 jam dilanjutkan pemberian ekstrak lumut dengan dosis 10, 30, 60 dan 90 µg/mL selama 24 jam untuk uji viabilitas dan uji kadar NO serta konsentrasi 5, 10, dan 30 µg/mL selama 24 jam untuk uji ekspresi protein HSP70). Hasil penelitian menunjukkan aktivitas antioksidan lumut hati sangat kuat dengan IC_{50} 5,22 µg/mL, meningkatkan viabilitas dan dapat menurunkan ekspresi HSP70 serta produksi NO sel HEK293 menuju level basal. Hasil statistik menunjukkan adanya signifikasni viabilitas dan produksi NO pada perlakuan timbal terhadap perlakuan ekstrak.

Kata Kunci : *Marchantia polymorpha*, stress oksidatif, sel HEK293, antioksidan, HSP70