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EFFICACY OF *ALLIUM CEPA* (AMARYLLIDACEAE) EXTRACT AGAINST DENGUE VIRUS TYPE-2 (*FLAVIVIRIDAE* : *FLAVIVIRUS*) ISOLATED FROM SURABAYA, INDONESIA

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ABSTRACT : Nowadays, dengue disease is still a major health problem in Indonesia. However, Surabaya, the second-largest city in the country is endemic for dengue. Dengue virus (DENV) is the causative agent of dengue fever and dengue shock syndrome or dengue haemorrhagic fever. At present, no antiviral drugs are available for treatment DENV infections. Therefore, we aimed to investigate the antiviral activity of *Allium cepa* extract (ACE) against dengue virus type-2 (DENV-2; NCBI accession number: KT012509) isolated from Surabaya, Indonesia in 2013. Interestingly, we revealed that ACE inhibited DENV-2 in Vero cells with IC_{50}: 1,932.36 ìg/mL, CC_{50}: 121.17 ìg/mL and SI: 0.06. Notably, findings presented here suggest that ACE considered as low concerning antiviral activityagainst DENV-2. In sum, ACE should be considered for re-evaluation in the development of an effective antiviral compound against DENV-2.

Key words : *Allium cepa*, antiviral, DENV-2, Vero cell.

INTRODUCTION

Dengue disease is an important mosquito-borne viral infectious disease in tropical and subtropical regions (Ansori *et al*, 2015). Approximately 390 million cases are reported worldwide and at least 2.5 billion people are at high risk (Dhewantara *et al*, 2019). Indonesia, located in Southeast Asia, is a tropical country and home of both main mosquito vector species of dengue virus (DENV), *Aedes aegypti* and *Aedes albopictus* (Kraemer *et al*, 2015). Indonesia and other subtropical regions are hyper-endemic, thus are at increased risk of disease impact (Utama *et al*, 2019). Dengue outbreaks in Indonesia occurred for the first time in Jakarta and Surabaya in 1968 (Hotta *et al*, 1968). To date, dengue outbreaks have been reported in all 34 provinces and 514 districts across the country. The infection is caused by four unique DENV serotypes (DENV-1 to DENV-4) belonging to the Flaviviridae family (Dhewantara *et al*, 2019). Up until today, there is no effective antiviral or vaccine available for dengue disease (Ansori *et al*, 2018). However, vaccination has now been trialed in many endemic Asian countries including Indonesia (Arredondo-García *et al*, 2018).

In addition, Indonesia is the top five countries in the world that has high plant diversity, including approximately 6,000 medicinal plants (Nugraha and Keller, 2008). Consequently, Indonesia is rich in medicinal plants used by its population in curing many diseases (Husen *et al*, 2019; Ansori *et al*, 2020; Fadholly *et al*, 2020; Tacharina *et al*, 2020). Furthermore, medicinal plants are used in many countries with natural diversity resources, including Indonesia (Ansori *et al*, 2019). Medicinal plants were found for antiviral substances (Abd Kadir *et al*, 2013), such as Amaryllidaceae (Lee *et al*, 2012), Euphorbiaceae (Klawikkan *et al*, 2011), Fabaceae (Srivastava and Kapoor, 2005) and so on.

Allium cepa, commonly known as brown or yellow onion, is a worldwide culinary spice belonging to the *Amaryllidaceae* family (Fadholly *et al*, 2019). *Allium cepa* has some active compounds, such as phenolic acids, thiosulfates, saponins and flavonoids. The plant has a variety of pharmacological activities including anticancer, antidiabetic, antimicrobial, cardiovascular and antioxidant effects (Liguori *et al*, 2017). In addition, *Allium* species