ANTIOXIDANT AND ANTIVIRAL ACTIVITY OF COMMON POLYPHENOLS AGAINST INFLUENZA A VIRUS

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SUMMARY

In this study, we compared the antioxidant activity, cytotoxicity, and antiviral activity of ten common phenolic acids and flavonoids which naturally occurred in many plants and byproducts sources. Antioxidant activity was analyzed using 1,1-diphenyl-2-picrylhydrazyl (DPPH) and 2,2′-azinobis (3 ethylbenzothiazoline-6-sulfonic acids) (ABTS) radical-scavenging activity, while cytotoxicity and antiviral effects of the polyphenols were evaluated using MDCK cells line model. The results showed that different phenolic acids and flavonoids showed a significant difference in antioxidant activities as well as cytotoxicity. Amongst tested compounds, pyrogallol and catechin showed higher DPPH radical scavenging ability, while ellagic acid and quercetin had the higher ability for ABTS assay. Furthermore, our results indicated that the antiviral activity potential varied significantly among polyphenols, and that several compounds including gallic acid, quercetin, rutin and vanillic acid have potent antiviral activity against the influenza A virus.

***Keywords*:** *antioxidant, antiviral activity, cytotoxicity, flavonoids, influenza, phenolics.*

1. INTRODUCTION

Polyphenols have various clinical properties such as anti-oxidant, anti-inflammatory, antitumor, and antiviral. Due to this research on natural phytoconstituents (such as medicinal plants, native flora, and marine materials) are considered as a potential source in the development of functional foods and treatment of various diseases. Polyphenols such as catechin, gallic acid, rutin, quercetin, pyrogallol, caffeine, etc. are naturally occurring plant metabolites widely available in fruits, vegetables, nuts, and in many agro-industrial byproducts such as peels, seeds, leave, wine pomace, tea residues, and coffee spent. Polyphenols are well-known for their antioxidant properties due to the ability to scavenge free radicals. Many previous studies have shown that phytochemicals from plants and vegetables are believed to provide potential antioxidant. Also, it is known that phenolic acids, flavonoids produce a broad spectrum of unique biological effects such as antioxidant, anticancer, antimicrobial, etc. (Lin *et al.*, 2016); (Friedman, 2007). Still, much interesting is remaining to find out new sources and new methods to assess and isolate antioxidant from natural for a variety of applications. Earlier, it has been opined that the difference in the structure of phenolic components, as well as the methodology of the antioxidant assay, may cause different results in the assessment of antioxidant ability (Celep, Aydin and Yesilada, 2012).

In recent years, the utilization of phenolics and flavonoids from natural resources has become a hot issue due to its pivotal roles in many physiological, biological and pathological processes (Lin *et al.*, 2016); (Friedman, 2007). Studies have demonstrated the antioxidative activities and main mechanisms, however, exploring the benefits from nature, and especially, exploiting natural waste as agro-industrial byproducts as a potential source for therapeutic application is still a highly required in order to support further understand their metabolism and defense/safety properties in the human (Lin *et al.*, 2016).

On the other hand, influenza viruses (IVs) remain a significant threat that can cause severe morbidity and mortality responsible for epidemics and pandemics worldwide (Ju *et al.*, 2017). IVs are the group of enveloped RNA viruses belonging to the *Orthomyxoviridae* family is one of the most common infectious respiratory diseases. At present there are two main methods for control and treatment of influenza viruses include vaccination and antiviral drugs (DIng *et al.*, 2017). Studies have reported that the slow response to vaccines in dealing with epidemic outbreaks and the reducing the effectiveness of vaccination. Moreover, the resistance of IVs to current anti-IVs drugs has been emerging, and seasonal influenza viruses continue to cause epidemics around the world each year (DIng *et al.*, 2017). Therefore, it has been extensive interest in developing a new antiviral treatment for

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