

Antiviral Activity of *Syzygium polyanthum* Extract against Herpes Simplex Virus-Type 1 (HSV-1)

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Abstract

Herpes simplex virus type 1 (HSV-1) is part of the alpha subfamily of human herpesviruses. Several antiviral medications can be prescribed for treating HSV-1 which is usually first line antiviral agents such as acyclovir (ACV). But there are several cases that have been reported on ACV resistance to HSV, thus, researchers tend to develop the antiviral agent from plants extract. *Syzygium polyanthum* is one of the plants that has been traditionally used as a drug which is rich in bioactive compounds, including essential oils, terpenoids, tannins, and flavonoids [1]. These phytochemical compounds, which have strong antioxidant action, can aid in the inhibition of viral genome replication which disables the viral lipid envelope [2].

The objective of this study is to determine the cytotoxic concentration (CC₅₀) and antiviral activity of *S. polyanthum* methanolic extract. Cytotoxicity was performed using the method described by [3]. The absorbance readings were analysed using microplate reader (Infinite M200 Pro). The 50% cytotoxicity concentration (CC₅₀) was defined as the sample concentration that able to reduce 50% of cell viability compared to the untreated cells. Antiviral activity was performed by using plaque reduction assay with three different treatments [3] which are post- treatment, pre-treatment and virucidal assay. The numbers of plaques were counted, and the antiviral activity was determined using the formula below:

$$\frac{\text{No. plaque}_{\text{infected non-treated}} - \text{No. plaque}_{\text{infected with treatment}}}{\text{No. plaque}_{\text{infected non-treated}}} \times 100$$

Based on Figure 1, cytotoxicity screening against Vero cells using MTT assay showed that the CC₅₀ values for extract was 0.135 mg/mL which considered not in the range of cytotoxic compounds. Any CC₅₀ or IC₅₀ of a substance less than 4 µg/mL was considered an active cytotoxic effect [4].

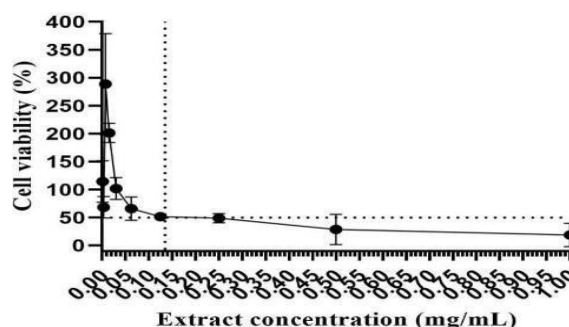


Figure 1: Cytotoxicity analysis of *S. polyanthum* methanolic extract

Based on Figure 2, post treatment assay showed the most anti-HSV-1 activity of *S. polyanthum* extract which the EC_{50} and SI value were 0.015mg/mL and 9.03, respectively. The extract showed to be slightly effective in reducing HSV-1 replication after 2-hour incubation which might be due to the inhibition in the early phase of the attachment. For pre-treatment, EC_{50} and SI values were 0.019 mg/mL and 7.12, which the extract showed to be moderately effective in inhibiting the attachment of HSV-1 before the replication can occur. This might occur as Vero cells bind to the extract that could interfere with the cell membrane's glycoprotein receptors which prevented HSV-1 from attaching to the cell surface [5]. The EC_{50} and SI value for virucidal assay was 0.018 mg/mL and 7.28 as the result showed moderately effective inhibited the viral replication. *S. polyanthum* has been shown to directly inactivate HSV-1 virions within 30 minutes of exposure in this study. An SI value greater than 10 ($SI > 10$) indicates that any antimicrobial compound has the potency to become an antiviral treatment agent [6].

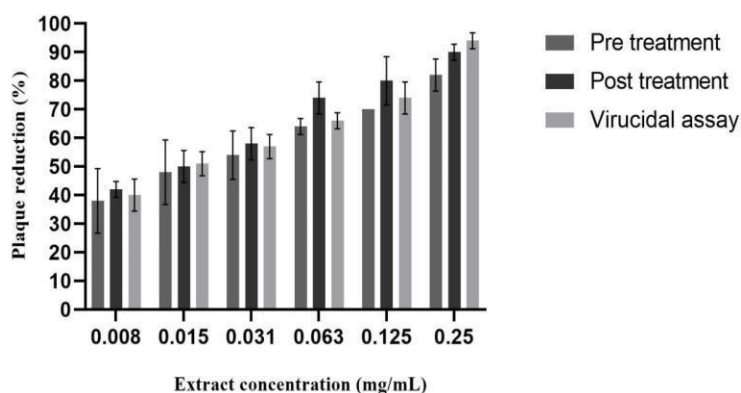


Figure 2: Plaque reduction assay with different *S. polyanthum* methanolic extract concentrations via Pre- treatment, Post-treatment and, Virucidal assay

In conclusion, the findings of this study demonstrate that *S. polyanthum* extract seems to have moderate antiviral effects and non-toxic to Vero cells.

Keywords

Antiviral assay, Cytotoxicity assay, HSV-1, *S. Polyanthum* extract, CC_{50} , EC_{50}

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