In vitro cytotoxic, antiviral and immunomodulatory effects of Plantago major and Plantago asiatica.


Source

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Abstract

Plantago major linn. and P. asiatica Linn. (Plantaginaceae) are commonly used as folk medicine in Taiwan for treating infectious diseases related to the respiratory, urinary and digestive tracts. In this study, we investigated the antiviral, cytotoxic and immunomodulatory activities of hot water extracts of these two species in vitro on a series of viruses, namely herpesviruses (HSV-1 and HSV-2), adenoviruses (ADV-3, ADV-8 and ADV-11), and on various human leukemia, lymphoma and carcinoma cells with XTT, BrdU and IFN-gamma kits. Results showed that hot water extract of P. asiatica possessed significant inhibitory activity on the proliferation of lymphoma (U937) and carcinoma (bladder, bone, cervix, kidney, lung and stomach) cells and on viral infection (HSV-2 and ADV-11). P. major and P. asiatica both exhibited dual effects of immunomodulatory activity, enhancing lymphocyte proliferation and secretion of interferon-gamma at low concentrations (< 50 microg/ml), but inhibiting this effect at high concentration (> 50 microg/ml). The present study concludes that hot water extracts of P. major and P. asiatica possess a broad-spectrum of antileukemia, anticarcinoma and antiviral activities, as well as activities which modulate cell-mediated immunity. Further investigations to elucidate the active component(s) of P. asiatica and P. major and to evaluate their clinical application are warranted.

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Antiviral activity of Plantago major extracts and related compounds in vitro.

Abstract

Plantago major L., a popular traditional Chinese medicine, has long been used for treating various diseases varying from cold to viral hepatitis. The aim of present study was to examine the antiviral activity of aqueous extract and pure compounds of P. major. Studies were conducted on a series of viruses, namely herpesviruses (HSV-1, HSV-2) and adenoviruses (ADV-3, ADV-8, ADV-11). The antiviral activity of EC50 was defined as the concentration achieved 50% cyto-protection against virus infection and the selectivity index (SI) was determined by the ratio of CC50 (concentration of 50% cellular cytotoxicity) to EC50. Results showed that aqueous extract of P. major possessed only a slight anti-herpes virus activity. In contrast, certain pure compounds belonging to the five different classes of chemicals found in extracts of this plant exhibited potent antiviral activity. Among them, caffeic acid exhibited the strongest activity against HSV-1 (EC50=15.3 microg/ml, SI=671), HSV-2 (EC50=87.3 microg/ml, SI=118) and ADV-3 (EC50=14.2 microg/ml, SI=727), whereas chlorogenic acid possessed the strongest anti-ADV-11 (EC50=13.3 microg/ml, SI=301) activity. The present study concludes that pure compounds of P. major, which possess antiviral activities are mainly derived from the phenolic compounds, especially caffeic acid. Its mode of action against HSV-2 and ADV-3 was found to be at multiplication stages (postinfection of HSV-1: 0-12 h; ADV-3: 0-2 h), and with SI values greater than 400, suggesting the potential use of this compound for treatment of the infection by these two viruses.

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