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Identification and Quantification of Sesquiterpene Lactones of Sagebrush (Artemisia tridentate) and Its Chemical Modification

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Abstract : Sagebrush is an abundant and naturally occurring plant in the Intermountain West region of the United States. The plant contains an array of bioactive compounds such as flavonoids, terpenoids, sterols, and phenolic acids. It is important to identify and characterize these compounds because Native Americans use sagebrush as herbal medicine. These compounds are also utilized for preventing infection in wounds, treating headaches and colds, and possess antitumor properties. This research is an exploratory study on the sesquiterpene present in the leaves of sagebrush. The leaf foliage was extracted with 100 % chloroform and 100 % methanol. The percentage yield for the crude was considerably higher in chloroform. The Thin Layer Chromatography (TLC) analysis of the crude extracted unveiled a brown band at Rf = 0.25 and a dark brown band at Rf = 0.74, along with three unknown faint bands the 254 nm UV lamp. Furthermore, the two distinct brown (Achillin) and dark brown band (Hydroxyachillin) in TLC were further utilized in the isolation of pure compounds with column chromatography. The structures of Achillin and Hydroxyachillin were elucidated based on extensive spectroscopic analysis, including TLC, High-Performance Liquid Chromatography (HPLC), 1D- and 2D-Nuclear Magnetic Resonance (NMR), and Mass Spectroscopy (MS). The antioxidant activities of crude extract and three pure compounds were evaluated in terms of their peroxyl radical scavenging by Ferric Reducing Ability of Plasma (FRAP) and 1,1-Diphenyl-2-picryl-hydrazyl (DPPH) methods. The crude extract showed the antioxidant activity of 18.99 ± 0.51 µmol TEg -1 FW for FRAP and 11.59 ± 0.38 µmol TEg -1 FW for DPPH. The activities of Achillin, Hydroxyachillin, and Quercetagetin trimethyl ether were 13.03, 15.90 and 14.02 µmol TEg -1 FW respectively for the FRAP assay. The three purified compounds have been submitted to the National Cancer Institute 60 cancer cell line for further study.

Keywords : HPLC, nuclear magnetic resonance spectroscopy, sagebrush, sesquiterpene lactones
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