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Determination of 1-Deoxynojirimycin and Phytochemical Profile from Mulberry Leaves Cultivated in Indonesia

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Abstract : Mulberry is a plant that widely cultivated around the world, mostly for silk industry. In recent years, the study showed that the mulberry leaves have an anti-diabetic effect which mostly comes from the compound known as 1-deoxynojirimycin (DNJ). DNJ is a very potent α-glucosidase inhibitor. It will decrease the degradation rate of carbohydrates in digestive tract, leading to slower glucose absorption and reducing the post-prandial glucose level significantly. The mulberry leaves also known as the best source of DNJ. Since then, the DNJ in mulberry leaves had received a considerable attention, because of the increased number of diabetic patients and the raise of people awareness to find a more natural cure for diabetic. The DNJ content in mulberry leaves varied depend on the mulberry species, leaf's age, and the plant's growth environment. Few of the mulberry varieties that were cultivated in Indonesiaare Morus alba var. kanva-2, M. alba var. multicaulis, M. bombycis var. lembang, and M. cathayana. The lack of data concerning phytochemicals contained in the Indonesian mulberry leaves are restraining their use in the medicinal field. The aim of this study is to fully utilize the use of mulberry leaves cultivated in Indonesia as a medicinal herb in local, national, or global community, by determining the DNJ and other phytochemical contents in them. This study used eight leaf samples which are the young leaves and mature leaves of both Morus alba var. kanva-2, M. alba var. multicaulis, M. bombycis var. lembang, and M. cathayana. The DNJ content was analyzed using reverse phase high performance liquid chromatography (HPLC). The stationary phase was silica C18 column and the mobile phase was acetonitrile:acetic acid 0.1% 1:1 with elution rate 1 mL/min. Prior to HPLC analysis the samples were derivatized with FMOC to ensure the DNJ detectable by VWD detector at 254 nm. Results showed that the DNJ content in samples are ranging from 2.90-0.07 mg DNJ/ g leaves, with the highest content found in M. cathayana mature leaves (2.90 ± 0.57 mg DNJ/g leaves). All of the mature leaf samples also found to contain higher amount of DNJ from their respective young leaf samples. The phytochemicals in leaf samples was tested using qualitative test. Result showed that all of the eight leaf samples contain alkaloids, phenolics, flavonoids, tannins, and terpenes. The presence of this phytochemicals contribute to the therapeutic effect of mulberry leaves. The pyrolysis-gas chromatography-mass spectrometry (Py-GC-MS) analysis was also performed to the eight samples to quantitatively determine their phytochemicals content. The pyrolysis temperature was set at 400 °C, with capillary column Phase Rtx-5MS 60 × 0.25 mm ID stationary phase and helium gas mobile phase. Few of the terpenes found are known to have anticancer and antimicrobial properties. From all the results, all of four samples of mulberry leaves which are cultivated in Indonesia contain DNJ and various phytochemicals like alkaloids, phenolics, flavonoids, tannins, and terpenes which are beneficial to our health.

Keywords : Morus, 1-deoxynojirimycin, HPLC, Py-GC-MS
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