

Antioxidant and Antimicrobial Screening of Isolated Alkaloids from *Tinospora crispa*

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Abstract. The antioxidant capacity by DPPH radical scavenging and antimicrobial activity by disk diffusion and broth microdilution method of nine isolated alkaloids from *T. crispa* were evaluated. All isolated alkaloids had been divided into three groups which were aporphine alkaloids, *N*-formylannonaine (1), *N*-formylornuciferine (2), magnoflorine (9), oxoaporphine alkaloids, lysicamine (3) and liriodenine (4); and protoberberine alkaloids, columbamine(6), dihydrodiscretamine (7) and 4,13-dihydroxy-2,8,9-trimethoxydibenzo [a,g]quinolizinium (8). Protoberberine alkaloids showed (IC₅₀ > 500-800 µg/mL) radical scavenging activity while oxaporphine alkaloids inhibited the growth of the *Gram*-positive bacteria, *Staphylococcus aureus* (+) and *Enterococcus faecalis* (+). The antioxidant and antimicrobial properties of different compounds support documented traditional use of *T. crispa* in wound healing and treatment of rheumatic, diarrhoea, ulcers, itches and wounds. Results of the present biological activity investigation further points to the potential of this plant species as a good source of natural antioxidant and preservative in food industry.

Introduction

Antioxidants are widely used in food industry to protect food from oxidative processes. The process of oxidizing food can lead to the deterioration of nutrient quality, color, taste and food safety. Therefore, a number of synthetic antioxidants are added to the food. This poses toxicity issues and adverse reactions such as carcinogenicity. With the problem of using synthetic antioxidants, researchers are more focused on the development / separation of natural antioxidants from botanical sources, especially edible plants. In addition, food damage can also be caused by microorganisms. To control the quality and shelf life of the food from microorganisms, preservatives are needed. Synthetic preservatives derived from chemicals cause toxicity issues. As a result, there has been an increase in interest among researchers to find potential compounds as antioxidants and antimicrobials from natural sources that are safe over to human health, as well as pharmaceutical and food industries.

Tinospora crispa (Menispermaceae) is a climbing; dioeciously vine reaching a height of 4-10 meters and it is found in primary rainforests or mixed deciduous forests throughout a large part of Asia and Africa [1]. *T. crispa* is known as “patawali” or “akar seruntum” in Malay, “boraphet” in Thai, “makabuhay” in Philipines, “day coc” in Vietnamese and Bo Ye Qing Niu Dan in Chinese [2]. *T. crispa* is widely used in traditional medicine as an antipyretic, an antidiabetes agent, for treating internal inflammation, reducing thirst, increasing appetite, cooling down the body temperature and for maintaining good health [3]. It is also used for the treatment of stomach troubles, ulcers and fevers, as a tonic and a febrifuge for malaria and smallpox, as a vulnerary for itches and wounds, and many other purposes [4]. The chemical constituents of *T. crispa* extracts have been extensively studied since the 1980s. Although the same species had been studied by researchers from Malaysia, China, Pakistan, India and Thailand, different localities or environment