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Beyond Classical Approaches

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THE COMPOSITION AND VARIABILITY OF THE LEAF OILS IN THREE *PIPER* SPP. FROM SARAWAK

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ABSTRACT

The leaf essential oils composition of *Piper aduncum, P. porphyrophyllum* and seven varieties of *P. nigrum* were analysed using gas chromatography-mass spectrometry (GC/MS) technique. All leaf oils studied containing caryophyllene and δ-elemene with quantities ranged from 1.15-9.00% and 0.42-24.73%, respectively. The major constituent found in the leaf oil of *P. porphyrophyllum* was γ-palmitolactone (40.78%), whereas dill apiole (34.48%) was detected as major component in *P. aduncum*. Germacrene B was identified as a major component in Kuching, Semongok Wan and Semongok Aman varieties of *P. nigrum*, while δ-elemene was abundant in 841, 27283 and Semongok Perak varieties. However, (+)-sativene was identified as a major component in Semongok Emas variety. Cluster Analysis and Principal Component Analysis were used to evaluate the potential of leaf oil profile for classifying taxonomic relationships among species and varieties. The results showed a significant chemovariability within the leaf oils. Semongok Wan and Semongok Aman varieties of *P. nigrum* were clustered at the highest similarity level. Semongok Wan variety also showed a close relationship to Kuching variety, while Semongok Perak variety showed close correlation to 841 and 27283 varieties. Both chemometric analyses indicate that Semongok Emas variety of *P. nigrum*, *P. aduncum* and *P. porphyrophyllum* were separated apart from each other.

Keywords: *P. aduncum*; *P. nigrum*; *P. porphyrophyllum*; leaf oil; GC/MS; Cluster analysis (CA); Principal component analysis (PCA)

INTRODUCTION

Piper is one of the most abundant genera of Piperaceae, widely distributed and estimated to be 3600 species (Smith *et al.*, 2008). Sesquiterpenes was reported as frequent component in volatile oils of Piperaceae (dos Santos *et al.*, 2001). The essential oils of *Piper sp.* have been studied extensively (Potzernheim *et al.*, 2006; Mesquita *et al.*, 2006) and various chemical components especially terpenes were identified.

P. poryphyrophyllum or sirih harimau is an attractive-looking climber species. It was one of *Piper* species reported in Brunei by Coode *et al.* (1996) and had been applied as traditional remedy against leprosy, stomach-aches and skin diseases (Tawan *et al.*, 2002). *P. aduncum*, which is known as wild flowering shrub, is a native to tropical America, the West Indies, South-East Asia and the Pacific (Rogers and Hartemink, 2000; Hartemink, 2010). This species has been reported in Malaysia since the 1960s (Allen, 1966; Chew, 1972).

P. nigrum (black pepper) is a flowering vine and valued for its fruits as a spice and seasoning. *P. nigrum* is also utilized as healing spice, such as in Ayurvedic and Unani system of medicine (Mathew *et al.*, 2001). Sarawak is the major growing region for *P. nigrum* in Malaysia and it has been planted in Sarawak since 1856 (Sim *et al.*, 1993). Kuching variety is the traditional variety of *P. nigrum* in Sarawak (Janic, 2007), while Semongok Perak and Semongok Emas varieties are famous for their high yielding (Sparks, 2004). Semongok Aman is an improved variety that produces better berries and more tolerant to pepper plant diseases (Oxford Business Group, 2008).

This paper reports the variation of chemical composition in leaf oils from two species of *Piper* and seven varieties of *P. nigrum*. The oils were extracted using a Clavenger-type hydrodistillation apparatus and analyzed by gas chromatography/mass spectrometer (GC/MS). The results obtained may contribute to an understanding of the variation in chemical composition of leaf