ABSTRAK

APLIKASI *FLUORESCENCE SPECTROSCOPY* DAN METODE SIMCA UNTUK KLASIFIKASI PROPOLIS LOKAL DAN IMPOR

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Propolis adalah zat resin yang ditemukan menempel pada bunga, pucuk serta kulit kayu. Warnanya cokelat tua, bersifat pekat, bergetah, memiliki rasa pahit serta bau yang khas. Propolis sudah populer sebagai pengobatan alternatif dalam beberapa tahun terakhir. Zat bioaktif yang terdapat dalam propolis seperti flavonoid dan fenoliknya yang memberikan efek antioksidan, antikanker, antiinflamasi, antialergi, serta antivirus dan antibakteri. Pengklasifikasian propolis dilakukan karena masing-masing propolis memiliki kandungan dan komposisi kimia yang berbeda-beda tergantung asalnya. Dengan menggunakan alat spektroskopi fluoresensi portabel dan metode SIMCA membedakan propolis lokal (*Heterotrigona itama*) dengan propolis impor (*Apis mellifera*). Sampel dalam penelitian ini meliputi (PIB, n=75), (PLB, n=70), (PIL, n=60), dan (PLL, n=65). Spektra diambil sebanyak 5 kali pengulangan. Data spektra yang didapatkan kemudian dianalisis menggunakan perangkat lunak *The Unscrambler* versi 10.4 dan *Microsoft Excel.* Saat menganalisis data spektra, pola grafik yang berbeda dihasilkan untuk setiap jenis sampel karena perbedaan karakteristik dan penyerapan cahaya dari nilai intensitas yang diperoleh. Adapun hasil *pretreatment*

dengan menggunakan beberapa perlakuan maka didapatkan *pretreatment* terbaik MSC + *Smoothing Moving Average* 7 *segment* untuk sampel PIL dan PLL menunjukkan nilai akurasi 95%, sensitivitas 90%, spesifisitas 100%, dan eror 5,0% dengan persentase PC-1 95,0% dan PC-2 3,7% sehingga PC kumulatif 98,7%. Pada sampel PIB dan PLB diperoleh *pretreatment Smoothing Moving Average* 3 *segment* kemudian menunjukkan nilai akurasi 100%, sensitivitas 100%, spesifisitas 100%, dan eror 0% dengan persentase PC kumulatif 95,5%. Berdasarkan kurva ROC sampel PIB dan PLB diklasifikasikan sebagai sangat baik (*excellent classification*) karena berada tepat di titik koordinat (0,1).

Kata Kunci: Propolis, Spektroskopi Fluoresensi, *Pretreatment*, PCA, SIMCA

ABSTRACT

APPLICATION OF FLUORESCENCE SPECTROSCOPY AND SIMCA METHOD FOR CLASSIFICATION OF LOCAL AND IMPORTED PROPOLIS

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Propolis is a resinous substance found attached to flowers, shoots and bark. It is dark brown in colour, concentrated, gummy, has a bitter taste and a distinctive smell. Propolis has been popular as an alternative medicine in recent years. Bioactive substances found in propolis such as flavonoids and phenolics provide antioxidant, anticancer, anti-inflammatory, antiallergic, and antiviral and antibacterial effects. The classification of propolis is done because each propolis has different content and chemical composition depending on its origin. By using a portable fluorescence spectroscopy device and the SIMCA method, local propolis (*Heterotrigona itama*) was distinguished from imported propolis (*Apis mellifera*). The samples in this study included (PIB, n=75), (PLB, n=70), (PIL, n=60), and (PLL, n=65). Spectra were taken for 5 repetitions. The spectra data obtained were then analysed using The Unscrambler software version 10.4 and Microsoft Excel. When analysing the spectra data, different graphical patterns were generated for each sample type due to the different characteristics and light absorption of the intensity values obtained. As for the pretreatment results using

several treatments, the best pretreatment was obtained MSC + Smoothing Moving Average 7 segment for PIL and PLL samples showed an accuracy value of 95%, sensitivity of 90%, specificity of 100%, and error of 5.0% with a percentage of PC-1 95.0% and PC-2 3.7% so that the cumulative PC was 98.7%. The PIB and PLB samples obtained *Pretreatment S*moothing Moving Average of 3 segments then showed an accuracy value of 100%, sensitivity of 100%, specificity of 100%, and error of 0% with a percentage cumulative PC was 95.5%. Based on the ROC curve, the PIB and PLB samples are classified as excellent classification because they are right at the coordinate point (0,1).

Keywords: Propolis, Fluorescence Spectroscopy, Pretreatment, PCA, SIMCA