以近紅外線光譜技術進行國產與泰國進口蜂蜜快速品質分析與鑑別之研究

Rapid Quality Analysis and Discrimination of Taiwan and Thailand-imported Honey by Near Infrared Spectroscopy

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[摘要]

蜂蜜是養蜂業最重要的產品之一，近年來蜂蜜產品自世界各國進口，其中以泰國為最大宗，然而國內對於國產與泰國進口蜂蜜品質差異的分析研究卻少有報告可供參考。本研究除了以一般傳統物化分析兩者品質及差異外，並以近紅外線光譜技術進行蜂蜜成分的快速定量分析以及來源的鑑別。本研究以 111 件涵蓋兩個生產年度之國產及泰國進口蜂蜜樣品為試驗材料。對於蜂蜜物化特性的分析結果顯示，國產及泰國進口蜂蜜樣品在一般組成分分析上差異並不大。兩者主要差異在前者水分含量普遍較高及而後者之澱粉酶活性值較低。若以中國國家標準之級區分，2001 年樣品部分國產蜂蜜與泰國蜜樣品達乙級以上標準者分別佔 74 及 80 % 。2000 年蜂蜜樣品，國產蜂蜜與泰國蜜樣品不列入等級標準者，則各佔 66.67 以及 81.82 %。利用近紅外線光譜技術於 111 件蜂蜜樣品組成份之快速分析上，色澤之 L 值、a 值、b 值、可溶性固形物、水活性、水分含量、還原糖、葡萄糖含量等 8 條檢量線，其 R2 值分別可達 0.93、0.97、0.83、0.95、0.99、0.93、0.85 以及 0.91，預測效果之相關係數分別為 0.93、0. 97、0.86、0.95、0.98、0.91、0.87 以及 0.85，顯示此七條物化分析值之檢量線已可應用於蜂蜜之快速分析上。 蜂蜜樣品之 17 項物化分析特性進行主成分分析的結果顯示，樣品加入產地及生產年度兩項類別變異，可解釋所有樣品變異之 44 %，整體來說，利用類別變異進行蜂蜜樣品主成分分析，可將大部分樣品依生產地區及年度區分開來。利用蜂蜜之物化特性進行蜂蜜來源的模式鑑別分析時，泰國進口蜂蜜被鑑別錯誤的機率為 0 %，而國產蜂蜜被鑑別錯誤的平均機率為 10.1 %。近紅外線光譜數據以 PCA 法及 Fisher weight 法鑑別蜂蜜來源的結果顯示，國產及泰國進口蜂蜜彼此之間並不會鑑別錯誤，而以正典鑑別分析進行區分時，可利用第一項正典變數 CAN1= -2 作為區分國產及泰國進口蜂蜜之界限。有鑒於蜂蜜樣品物化分析值之測定較近紅外線光譜費時，因此利用近紅外線光譜技術分析及鑑別國產及泰國進口蜂蜜為一快速且有效之方法。

關鍵字: 近紅外線 near infrared spectroscopy NIR、蜂蜜 honey、品質分析 quality analysis、鑑別 discrimination、泰國 Thailand

[摘要]

Honey is one of the most important products in honey business. Recentlyhoney is imported from different countries in Taiwan. Among them,Thailand-imported honey is the most abundant. However, little information about thedifference between the quality of Taiwan and Thailand-imported honey was found in the literature. In this study, physicochemical analyses were used to examinethe quality of honey from the two origins, and with Near Infrared Spectroscopy(NIRS) to investigate the feasibility of rapid quality analysis and discrimination of the origins of honey. Totally 111 samples including Taiwan and Thailand-imported honey harvestedin year 2000 and 2001 were collected for this study. In the result of physicochemical analysis, the qualities between two regions of honey didnot differ much. The major differences between the two regions of honey werethat the water contents were higher in Taiwan honey and the diastaticactivities were lower in Thailand-imported one. According to the Chinese National Standard (CNS), 74 and 80 % of Taiwan and Thailand-imported honeyharvested in year 2001 respectively were of grade B. And 66.67 and 81.82 % of Taiwanand Thailand-imported honey harvested in year 2000 respectively were all belowthe grades A and B of CNS. The R2 of NIRS calibration curves of 111 honey samples for Hunter L, a, b, total soluble solids, water activities, moisture contents, reducing sugarand glucose contents were 0.93, 0.97, 0.83, 0.95, 0.99, 0.93 0.85 and 0.91, respectively. The correlation coefficients (r) for prediction of theseeight constituents were 0.93, 0.97, 0.86, 0.95, 0.98, 0.91, 0.87 and 0.85, respectively. It showed that these calibration curves could be used for rapidly determining the eight physicochemical characteristics of thesehoney samples. Based on the results of principal component analysis (PCA) with seventeen physicochemical characteristics, PCA with origins and harvested years categories could explain the 44 % variation of total honey samples.Generally speaking, PCA with categories could separate the honey samples withdifferent origins and harvested years. The pattern recognition analysis with the physicochemical characteristicsof honey was applied to classify the origins of honey. The average of error classification of Thailand-imported and Taiwan honey were 0 % and 10.1 % respectively. The results of the pattern recognition analysis with NIRspectra by PCA and fisher weights showed that the average of error classificationfor both Taiwan and Thailand-imported honey was 0 %. When the canonical discriminant analysis was used in pattern recognition, the first canonical variable (CAN1) could used to discriminate the Taiwan andThailand-imported honey by CAN1 = -2. In conclusion, the results of this study indicated that NIRS is a rapidand effective method for quality analysis and discrimination of Taiwan and Thailand-imported honey.