

**UNIVERSITI TEKNOLOGI MARA**

**INTELLIGENT GRADING OF  
KAFFIR LIME OIL QUALITY USING  
NON-LINEAR SUPPORT VECTOR  
MACHINE (NSVM) WITH RBF  
KERNEL**

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## ABSTRACT

Kaffir lime is originally from the Rutaceous family and is also known as 'Limau Purut'. These essential oils are extracted from leaves and peels. Nowadays, Kaffir lime oils are widely used in varieties of products and sold at erratic prices. However, the highest price of Kaffir lime oil does not guarantee the best quality oil of itself. The current method to rate the Kaffir lime oil by using human sensory such as nose and eyes provide confusion and inconsistent results. It can be concluded that sensory evaluation has the limitations such as easily fatigue and facing impossibilities to handle large samples at once. In order to solve this problem, many researchers discovered the chemical compound in Kaffir lime oil which can be used for oil quality grading to be more precisely. The objectives of this study are to identify the significant chemical compound in Kaffir lime oil based on Gas Chromatography-Mass Spectrometry (GC-MS) data and to develop a new model to classify the quality of Kaffir lime oils by applying the Non-linear Support Vector Machine (NSVM). 15 samples of Kaffir lime oil with different range of brands and prices from the highest to the lowest quality that were available in the market including the 11 samples of Kaffir lime oil from previous researchers were used in this study. Z-score technique is applied on GC-MS data to identify the significant compound in Kaffir lime oil. There are four significant compounds has been highlighted of Z-score which were Sabinene,  $\beta$ -Pinene, Limonene and Citronellal. Synthetic data was used to increase data from 26 to 104 data. The abundance (%) of significant chemical compounds were determined as the input while the classification of Kaffir lime oil quality produced whether in high or low quality which were performed as the result of the output using the NSVM method by tuning Radial Basis Function (RBF) and Polynomial as the kernel parameter. The results showed that the NSVM model using RBF kernel achieved 95% accuracy compared to polynomial only 60% for accuracy.

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