

# **Prediction of Pakistani Honey Authenticity through Machine Learning**

## **ABSTRACT**

Honey is a high-demand product in many countries because it is high in nutritional value and rich in antioxidants. Thus, the demand for honey is increased. However, the productivity of honey is naturally lower than its demand. Therefore, honey has often become a target for adulteration. Adulteration of honey is a critical issue because the nutritional value of pure honey is reduced by adding cheap and easily available sweeteners, affecting the consumers' health. Thus, investigating honey authenticity is popular among regulatory bodies, the food industry, retail sellers, and consumers. Several works have been done to predict the authenticity of honey using various physicochemical features. Few other works have also classified honey on the basis of geographical or botanical origin. However, previous studies have three major limitations. First, the existing studies used the imbalanced datasets, and the performance of these studies further needs attention. Second, as far as we know, no researcher has attempted to use machine learning approaches in investigating the adulteration of Pakistani honey. Finally, the dataset for predicting the authenticity of Pakistani honey is lacking. Therefore, this study proposes a novel classification model to address the aforementioned weaknesses by classifying the authenticity of Pakistani honey using machine learning algorithms and several physicochemical features. This work also presents three classification models systematically to classify the Pakistani honey into three levels. The first level classifies whether the honey is original or branded. The second level classifies the geographical origin. The botanical origin of honey is classified in the third level. Our experimental results show that the proposed features coupled with machine learning algorithms can predict the authenticity of Pakistani honey with outstanding results. We believe that our proposed work will be proved beneficial in reducing the adulteration of Pakistani honey.