

A Supervised Learning Approach to Detect Black Pepper Adulteration

N.N. Hansani* and C.R. Liyanage

Department of ICT, Faculty of Technology, University of Ruhuna

**Corresponding Author E-mail: nadeemahansani1996@gmail.com, TP: +94763694096*

Black pepper is one of the widely planted spices in the world and its cost is very high when compared to other spices. Many People earn huge income from black pepper by exporting and selling. Therefore, they mix unwanted adulterants, such as stones, weeds and other low-cost items in order to increase the quantity and the profit. Out of these adulterants, papaya seeds are very common, as their appearance is very similar to black pepper seeds. Those malpractices will reduce the quality of pepper samples and it is difficult to control as these two types of seeds cannot be easily classified even by an expert eye due to the smaller size in bulk samples. Hence, more advanced solutions are required to determine the adulteration of pepper samples. Currently, there are some existing studies and methods; one is a manual method to separate papaya and pepper seeds using water by considering their weights. Further, there are chemical methods, such as the Thin-Layer Chromatography (TLC) approach to detect the adulterated papaya seeds by using mixed samples of black paper powder and ground papaya seed. In this study, a classification method was proposed to differentiate black pepper from papaya seeds using the Convolutional Neural Network (CNN) technique. The images of the samples were captured using a high-resolution digital camera and the features, such as size and shape were extracted to classify the seeds. Next, these features were fed as the input to the CNN model for the classification task. The experimented model was able to successfully label the papaya and black pepper seeds with an accuracy rate of 85.94%. As the main output of the model, the percentages of papaya and pepper seeds in the given sample were presented. To improve the accuracy of the model, high-quality images and more features such as texture and color will be used in future work.

Keywords: Black Pepper Adulteration; Feature Extraction; Image Processing; Supervised Learning