

Title Neural network to separate aflatoxin contaminated pistachio nuts
Authors M.A. Karami, M. Mirabolfathy
Citation ISHS Acta Horticulturae 726:605-610. 2006.
Keywords image processing; perceptron; UV

Abstract

Aflatoxins are highly toxic and carcinogenic mycotoxins. Food subjected to aflatoxin contamination has been regulated by Codex Alimentarios rules. Contamination of pistachio lots with more than 2ppb were banned by EU member countries. Aflatoxin can occur at concentrations up to over 1,000,000 ppb in individual kernels. The solution to the aflatoxin problem in such cases is to remove the contaminated units from the product. The commercial practice to screen most nuts for aflatoxin is to remove stained, blemished, or insect damaged nuts with color sorters. Aflatoxin excretes Kojic acid, which after reaction with plant tissue is fluorescent after ultra violet illumination. This property has been used to develop manual sorting devices for aflatoxin contaminated commodities. In this paper a method of fluorescent sorting with neural network algorithms has been examined and aflatoxin contaminated nuts with the property of BGY (bright greenish yellow) fluorescent ex Citation were separated. To recognize the color of contaminated pistachio nuts an isolated box was designed which had a 365 nm UV lamp and got sample images through a CCD (Charge coupled device) overhead camera. The background was separated after getting images. Three different methods were defined: searching for threshold, finding the edges and using perceptron. After omitting the background the average of RGB (Red, Green, and Blue) factors of the mentioned images were calculated. After distinguishing the background and the kernels of pistachio under the light of 365 nm, UV a network system was used to separate contaminated nuts. The neural networks are composed of simple elements operating in parallel inspired by biological nervous system; the network function is determined largely by the connection between elements. The network is adjusted based on a comparison of the output and the target, until the network output matches the target. A perceptron with three inputs of RGB that sends a hard limit transfer function data, which shows that the pistachio is contaminated or not, was used to do this function. The new value of W (weight) and B (Bias) checked by computing the network output for each vector to see if all targets are attained. The W and B were reached after 6 epochs with above function and TRAINC function with the software of Matlab TM ver 6.5.1. We introduce a new method for separating aflatoxin contaminated pistachio nuts. This method is based on processing the picture of nuts under the UV light of 365nm and neural network algorithm to have a simple and accurate method, which will separate aflatoxin contaminated as well.