Detection of fungal infestation in citrus fruits using hyperspectral imaging

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Early fungi infection detection is especially important in citrus packinghouses because a few infected fruits can disseminate the infection to a whole batch, causing great economic loses and affecting further operations. *Penicillium digitatum* sp. produces the most important postharvest damages in citrus packinghouses. Nowadays, detection of this problem in the packing lines is carried out visually and fruits are removed manually. Rottenness causes damages in the skin of the fruit that are very difficult to detect in the early stages using visible lighting. Hyperspectral computer vision systems can be used to investigate the contribution of the different individual wavelengths to detection of the damages. However, the high amount of redundant information generated by these systems makes necessary the use of data mining techniques. Hyperspectral imaging has been employed in this work to detect citrus oil glands breakage caused by fungal infestation, in order to replace traditional UV illumination, which is the common method implemented in current packing houses. UV light is potentially harmful for the skin and eyes of human operators and for this reason important security measures must be adopted. In this work, different data reduction techniques and segmentation procedures were employed. Results showed that an algorithm based on classification and regression trees detected 91% of decayed fruit, providing a safer method for this inspection procedure than using induced UV fluorescence. These results are compared with other obtained using a standard colour imaging system, being considerably better.