X-ray µCT analysis to characterize cork spot disorder in Chinese pear 'Chili' (*Pyrus bretschneideri*)

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Abstract

Healthy and disordered fruit of Chinese 'Chili' (*Pyrus bretschneideri* Rehd.), a well-known pear cultivar in China, are used to investigate the cork spot disorder by non-destructive X-ray computed microtomography (µCT) scanning technology, with pixel resolution of 67-70 µm and scanning time of 60 min on intact fruit. The results suggested that X-ray µCT could clearly and accurately distinguish the internal organization, size and location of cork spot in the pear fruit. CT images showed that the spots mostly locate in the pulp tissue between the calyx end and the equator of disordered fruit, and usually within 14 mm below the pericarp. STL format 3D images had great potential to distinguish cork spotted fruit core from healthy one. In addition, total number of pores is strongly decreased while larger pores bigger than 900 µm are considerably increased in disordered fruit as compared to healthy fruit, which indicates that larger pores maybe formed by the extension and interconnection with adjacent pores of some small pores. Further analysis in pore skeleton-network shows that extremely higher porosity and highly branched, more connected and thicker pores are observed in cork spotted fruit than those in healthy fruit. In addition, the average length of the healthy pore throat is 160.08 µm, which is significantly smaller than that of disordered fruit (277.91 µm). Moreover, the coordination number of pores in cork spotted fruit is 2, while it is 0 in healthy fruit. All the above results indicate that X-ray µCT provides a new perspective to the non-destructive visualization, quantification and knowledge of the 3D image structure of pear fruit with cork spot, and it is highly essential for early diagnosis and further study of the pathogenic mechanism of this disorder.