

Abstract:

Cucumber is a chilling sensitive commodity and it is known to recover from injury by post-chilling treatments. Here, chilling induced change in membrane permeability is investigated. In order to find an appropriate probe for detecting the variation of membrane permeability, NMR measurement were performed with cucumber fruits of two varieties stored at chilling (2°C) and normal (15°C) temperatures. For the fruits produced in Japan (cv. Encore 10), T1 relaxation time of the fruits at a chilling temperature increased abruptly during the first 3 days storage, however visually detectable pitting did not appear until 5 days later. The sharp increase in T1 was due to a change in membrane permeability, which was supported by the increase in both pH and ion leakage rate. T1 images were obtained for fruits produced in USA (cv. Toska). The average of T1, in this case also, showed the increase during 3 days storage at chilling temperature. From these results, it was shown that the dynamic state of water in cucumber fruit changed according to a variation of membrane permeability induced by chilling impact. The early response of T1 to the increase in membrane permeability supports that T1 can be used as a probe to detect the chilling-induced permeability change of membrane and that it may also be applied to detect a possible membrane recovery after post-chilling treatment. Diffusion images obtained for fruits of live and dead cells provided a difference, which implies a freely permeable state in dead cell membranes.