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Basic Formation for Regulation of Tomato Fruit-Softening by Cell Wall Remodeling under the Salinity Condition

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Summary

Abiotic stresses, such as drought, salinity, extreme temperatures, chemical toxicity and oxidative stress are serious threats to plants and the natural status of the environment. Especially, high salinity causes ionic and osmotic stress, affecting plant growth and metabolism. However, it is known that salinity stress improves the fruit quality of tomato (*Solanum lycopersicum*) by increasing the level of total soluble solids, including sugars, organic acids, and amino acids in fruits. However, it also causes negative aspects such as reduction of fruit size, number and increase of fruit firmness. This change of fruit firmness during ripening is mainly as a consequence of the disassembly of different cell wall components. These events are accompanied by increased expression of various cell-wall degradation enzymes such as pectin methylesterase and polygalacturonase. Although many reports of the effects of salinity stress to tomato fruit ripening and softening are focused on the whole tomato fruit, the changes in each tissues are not well known. In this study, we focused on the increase of fruit firmness. To understand the function and regulation of cell wall in fruit softening under salinity stress, we measured fruit firmness, cell wall contents and pectin-related enzymatic activities. We measured fruit firmness (skin and mesocarp) used by acoustic vibration method. High levels of firmness were observed in skin, on the other hand, mesocarp showed about half level of firmness compared with control condition. It suggests that insides of fruits would be promoted softening. Thickness of cuticle increased under salinity stress. Cell wall pectin contents and pectin-related enzyme activity increased under salinity stress. These results suggest that cuticle layers development is important for the maintenance of high levels of fruit firmness for whole fruit and skin, and the changes of pectin features regulated by related enzymes, might contribute to fruit softening of mesocarp in tomato fruits under the salinity stress.