Structural Adaptation of Halophytic Chenopods Lacking Salt Excretory Structures

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High concentrations of salts usually cause an ion imbalance and a hyperosmotic stress internally in most plants. Plants maintained at high soil salinity generally develop certain structures either to tolerate or to survive such an adverse environment. Excretion of ions by special salt glands or any excretion structures in this matter are mechanisms well-known for regulating the mineral content of many halophytic plants. However, four chenopod halophytes; *Suaeda asparagoids*, *S. japonica*, *S. maritima*, and *Salicornia herbacea*, inhabitants of high saline soils, exhibited no signs of salt excretion structures internally or externally without wilting or cellular damage. Thus, the current study has attempted to assess the structural features of these halophytes to reveal their cellular characteristics during growth in salt tolerance. The most noticeable feature has been found in the epidermal surfaces. Cutinization has shown to be heavy on the outer walls of the epidermis and thick wax plates formed on the surface. Numerous vesicles and membranous invagination in the vacuole have been the most common feature in the cytoplasm. Invaginations of the vacuolar membrane frequently formed secondary vacuoles and/or became distinct membrane-bound compartments. None to little, if any, traces of salts have been detected in the mesophyll tissue close to the vein in any case. A considerable accumulation of sodium and chloride in the vacuole has been frequently suggested and this has been well demonstrated in the air-dried epidermis examined in the study. Salt tolerance mechanisms in these plants are to be discussed with respect to different plant modification to improve salt tolerance in various ways.

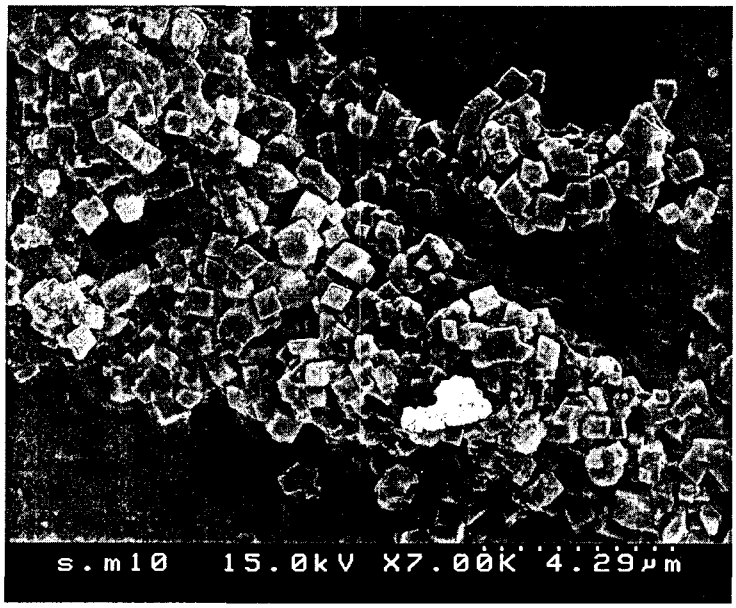

Fig. 1. Clusters of crystallized NaCl detected in the epidermal cell.

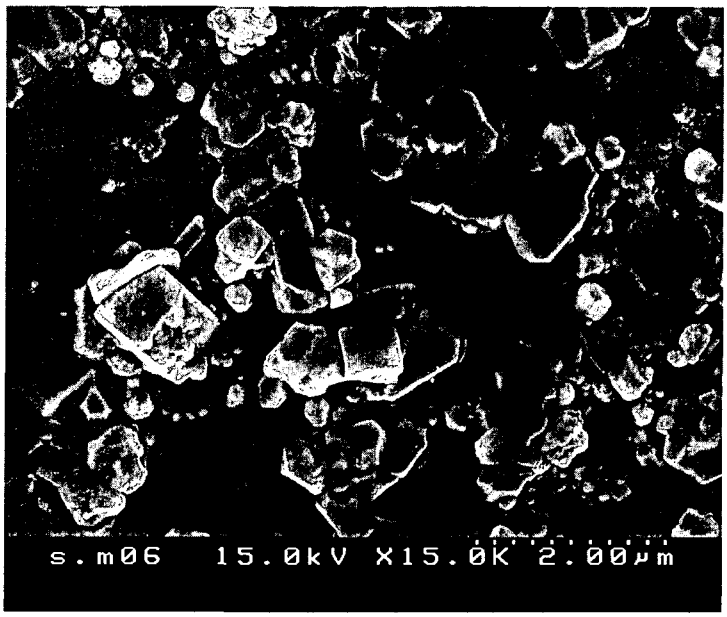

Fig. 2. Clusters of crystallized NaCl detected in the epidermal cell.