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Modelling the Round-off and the Tensile/Compressive Failure Behaviour of Plant and Vegetable Tissues

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Plant and vegetable tissues are treated as a lattice of identical 3D hexagonal cells, which are turgored and glued by a layer of the middle lamella pectin. The cell walls are treated as an anisotropic rubber-like material and the layer of the middle lamella pectin is treated as a set of one-dimensional springs made of a rubber-like material. Based upon the above mechanical model, the following works have been carried out: a) the cell round-off behaviour is modelled by looking at the deformed cell structure upon the continuously increasing turgor pressure; b) for a given turgor pressure, the mechanical response of the cells to the applied tensile/compressive stress has been simulated. All the possible failure mechanisms have been analysed, and the effects of the initial turgor pressure on the results a) and b) are discussed.

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