Modeling of plant cell growth

Optimization of secondary metabolite production of *H. annuus* and *Salvia* sp. with simulation tools

For cost and yield-oriented use of the production-capacity of plant cells at least a macroscopic, model-theoretic reproduction of the metabolism is necessary to adjust optimal cultivation conditions.

Aim of the work is the modeling, simulation and experimental proving of a cultivation process which is structured into biomass accumulation and production of secondary metabolites.

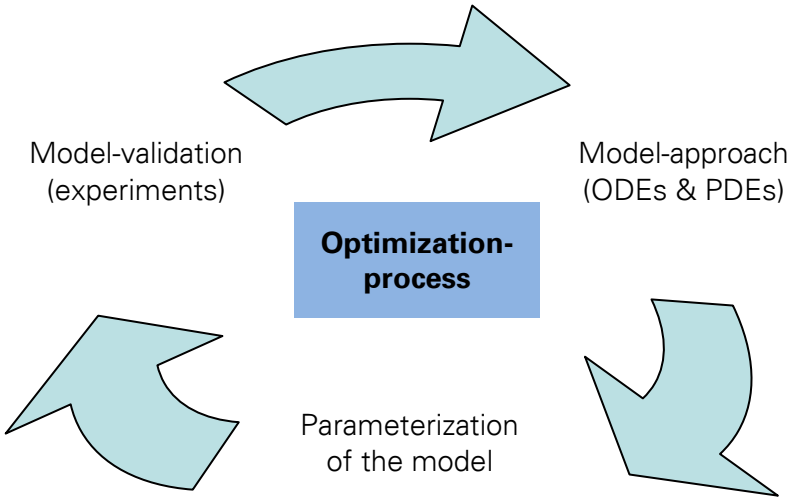

Illustration 1: optimization-process of a model

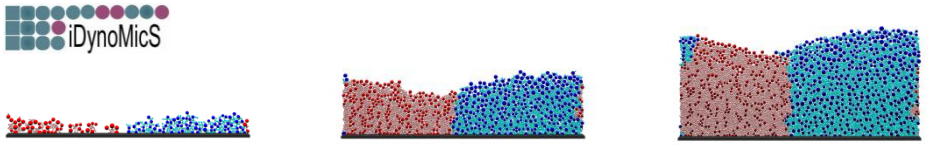

Illustration 2: simulation of single cell behavior with iDynoMiCS

The metabolism of a plant cell can be described by differential equations with predictions of biomass-, product- and nutrient-concentration changes.
Different characteristic values are necessary to parameterize the growth-model for Hairy root and callus-cultures (see also Internet-Business-Cards of K. Geipel & S. Schulz). With these parameters used in a simulation, a model can be validated. Arising discrepancies are minimized with a refining of the model and repeating of the process parameterization (see illustration 1).
The growth behavior of callus-cultures of sunflower (*H. annuus*) and sage (*Salvia* sp.) can be re-enacted with a simulator for individual based models (**iDynoMiCS**). The data gained from the simulations can be processed numerically or graphically generating picture sequences or videos for visualization (see illustration 2). A comparison of the simulation data and the experimental results is possible and a reduction of experimental efforts is aspired.

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