**Modeling and validating Pseudomonas aeruginosa kinetic parameters based on simultaneous effect of bed temperature and moisture content using lignocellulosic substrate in packed-bed bioreactor**

* An important factor in better designing of SSF bioreactors, is to provide the models in which transport phenomena and kinetic models are coupled to each other (try to get these parameters for ur system).
* in order to ease the biomass measurement. Respiratory measurement is one of the most important and useful methods for indirect measurement of biomass that in many researches (de Carvalho et al., 2006; Karimi et al., 2014) have been used. Measurement of O2 consumption or CO2 production rate in output air is a fast and practical way of providing a large amount of data that are directly related to microorganisms metabolism (once you have the kinetic parameters with you, you can estimate cell biomass by using OUR and CER data).
* Study of the effect of temperature on P. aeruginosa growth and production of rhamnolipid, modeling of growth kinetic and rhamnolipid production in constant environmental condition, are the reported cases in SmF (you can estimate the effect of bed temperature on *T. ressei* growth for ur case).
* The aim of this study was to determine kinetic parameters of a bacterial growth and its products formation **as functions of environmental conditions** and validate them by coupling transport phenomena and kinetic models to each other in a higher scale (**these people have defined kinetic parameters as function of environmental factors, i.e., kinetic parameters are not considered constant while validating rhamnolipid production which also takes into account the transport parameter In my opinion this is higher level study that you can do when you have already established or determined kinetic and transport parameters for the system, once you have those, you can start with :**

1. **Effect of operating parameters on bed temperature wherein parameters are constant.**
2. **Effect of biomass production on bed moisture content keeping parameters and operating variables constant.**
3. **As mentioned earlier, once you have the parameters, then you may use some CER/OUR data to predict cell biomass concentration in your case).**

* **Use equation 1 in section 2.6 to determine** μm and Xm
* **Use equation 3 to determine Ypx and mp,**
* **Equation 5, 6 and 7 he has just related the product formation rate (for CO2, water and rhamnolipid) with cell. biomass production kinetics. Here he has assumed that product formation is directly coupled with cell biomass formation. You can also do the same for your system and estimate many parameters using MATLAB, you only need to have dx/dt data, dCo2/dt data, DH2o/dt, d(cellulase)/dt data. Some of these data you can get from Raikamal, if some data you don’t have then search from literature for fungi system, use that data, and estimate ur process parameters).**
* **Use equ 10 and 12 to calculate rate of change of water in bed (u require dx/dt and experimental/reported data for variation of axial bed temperature) During my interaction with Prof. Ghosh few months back, he was interested in estimation of rate of change of bed water content in ur system.**
* The 2-dimensional heattransfer model presented in this study covers all the phenomena of heat transfer occurring in the bed (Eq. 14) (Sangsurasak and Mitchell, 1998). This model, from left to right, consists of the terms of accumulation of heat in the bed, the production of heat from the metabolic activity of microorganism, the transfer of heat from the forced air flow through the bed in axial direction (axial convection), the heat removal by water evaporation, thermal influx in axial direction, and conductive heat transfer is in radial direction, respectively
* U may Use equation 14 to estimate the variation in bed temperature with your parameters. The operating variables which you can change here shall be
* A. inlet moist air velocity vz
* B. inlet air temperature Ta