Notes on the optimization of berry growth

Parameters need to be optimized for berry dry mass:

After some model explorations I kept Km\_berry, Kleakage\_internode, Vmax\_root as the same, and optimize Vmax\_berry, Km\_root, Cstar (the accumulation of berry sugar uptake inhibitor).

Parameters need to be optimized for berry fresh mass:

I try to fix other parameters and adjust Lp to optimize the berry fresh mass

Lp = Lpmin+(Lpmax-Lpmin)/(1+exp(Lk\*(ageHour - Lh)))

As Lk and Lh have many interaction, after some exploration in R, I will just adapt Lh to optimize the model.

I will update the optimization routine to optimize dry mass and fresh mass simultaneously.

Data required for the carbon allocation (berry biomass) and berry fresh mass:

1. Initial carbon condition of each component at veraison stage;
2. Berry dry weight and fresh weight over time (the fresh weight of the seed is added as extra)
3. Hourly climate condition, temperature, RH, total radiation, soil water content (or soil water potential)
4. I used the Zhanwu’s data set in 2012 with both data on 12 leaves and 3 leaves for the model calibration

Please nominate a data set for validating the condition for cabernet Sauvignon

I will organize the data of Poni and see whether we miss something

Some adjustment I did when optimizing berry dry mass and fresh mass:

1. Berry mass flow set to zero when the phloem concentration is low;

2. Berry sugar inhibitor set to relates with sugar concentration.

3. Berry fraction of soluble sugar was no longer calculated as I use the fraction of sugars allocated to soluble sugar in the new calculation;

4. Three berries were removed every 7 days;

5. Lp is calculated as a function of time with four parameters. Parameters are calculated based on the model outputs parameterized by Zhanwu. I also tried simulate Lp based on the water mass of the berry. However the later resulted in lower sugar concentration under water stress condition.

6. Berry skin conductivity is also calculated with time. Parameters are calculated based on the model outputs parameterized by Zhanwu.

7. osmeticWaterPotential\_partialContribution is calculated based on sugar instead of time in the current model.

7. Initial condition at veraison needs to be specified: berry fresh weight, dry weight (include seed), berry sugar concentration, and berry age after veraison

8. reduced the maintenance of root to make root biomass more stable

9. Note in the code the phloem concentration is mgC/mgWater, and in the berry calculation it is converted into mgSucrose/mgWater; for converting phloem concentration from mg/mg into mmol/L

carbon\_fraction\_sucrose <-0.42

MolSucrose <- 342

table0$phloemCconcentration <- table0$phloemCconcentration/

carbon\_fraction\_sucrose/MolSucrose \* 1e6 # convert mg/mg to mmolSucrose/L