**BCH/PLS/PPA 609 3rd section exam May 6, 2010 (90 points)**

1. Describe the biosynthesis of the two main storage carbohydrates, starch and fructans, in underground storage organs starting with CO2 fixation in leaves. Provide names or structures of all intermediate molecules. (14 points)
2. Compare and contrast the structure and function of the four main groups of cell wall polymers. What is mean by soluble fiber? (16 points)
3. Describe metabolic changes you would propose to improve A). Biological nitrogen fixation and B). Nitrogen use efficiency in rice. (20 points)
4. α-linolenic acid,  , is an ω-3 fatty acid of immense importance in human health and as well as plant biology. Describe how you would propose metabolic engineering Arabidopsis seeds to increase the α-linolenic acid (18:3) content of seed oil TAG to 50% or more of seed oil fatty acids. Consider a possible role for phosphatidylcholine: diacylglycerol cholinephosphotransferase (PDCT) in your plan. (20 points)

The normal Mol % of fatty acids in WT Arabidopsis seed TAG are:

16:0 18:0 18:1 18:2 18:3 20:1

8.4 3.1 15.1 29.2 19.9 18.6

1. Name the following three alkaloids discussed this semester. Describe the three principal reactions involved in the formation of alkaloids. Tall fescue (*Lolium* arundinaceum) harbors an endophytic (e.g. *Neotyphodium ceonophialum*) fungus that improves plant host fitness and apparently benefits the fungus. How is this type of interaction classified? (20 points)

  