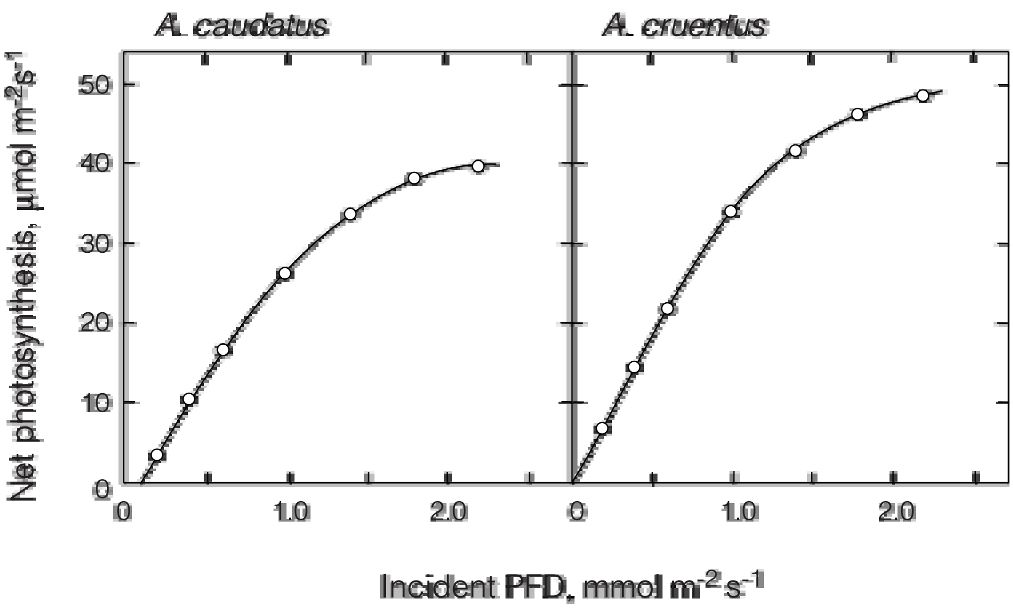
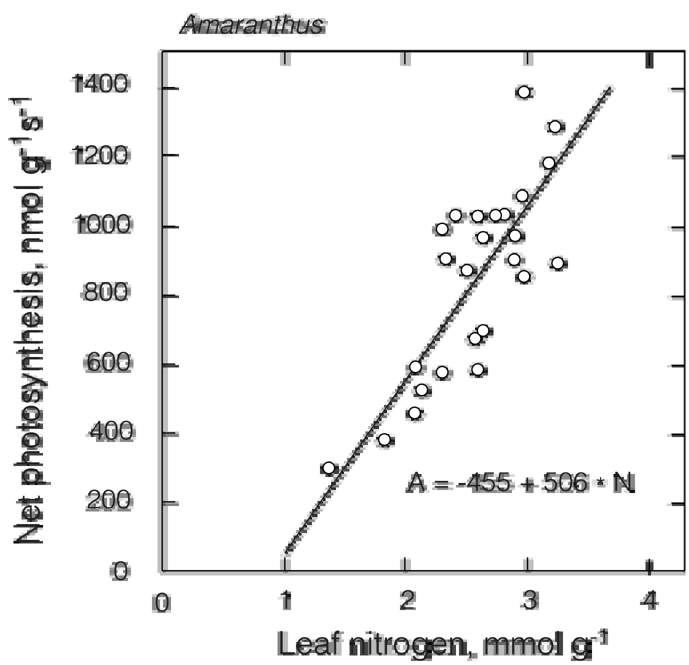
My brothers and I have had conversations about growing new crops in Utah. I have concluded that it is important that we begin to develop new crops for Utah, especially given the dry climate and the possibilities that water shortages in the future. One possible plant to consider is amaranth. There are several amaranths species (genus is *Amaranthus*) currently cultivated in central America, South America, and Africa. It turns out that the small seeds of amaranths are highly nutritious and can be popped just like pop corn. Additionally, the protein in amaranth seeds is highly balanced. Lastly, all amaranths are C4 plants. They are dicotyledonous and not monocotyledonous.

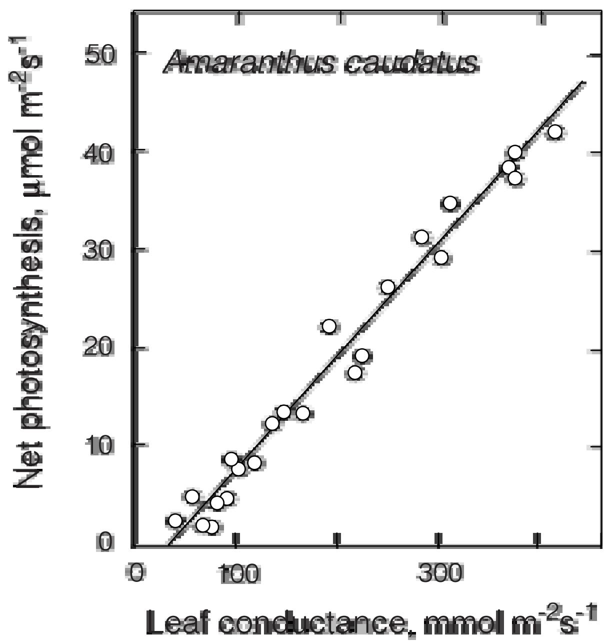
Below is the first set of my experimental results with amaranths. The photosynthetic dependence on PFD suggests that amaranth leaves are able to achieve a high photosynthetic rate. While these data are so simple to collect, it is hard for me to understand exactly what details of physiology can be extracted from these curves. Yet if I spent a few minutes with these data (and Ehleringer's lecture notes, of coutrse), I am sure that the patterns would be obvious.



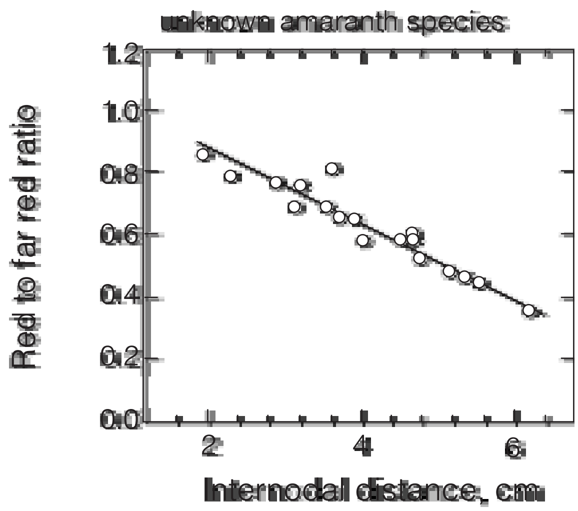
Upon further experimentation, I detected quite a bit of variability in the maximum photosynthetic rate of amaranths growing on my farm in Wanship. My sister Wanda had warned me about the differences in soil nitrogen availability, but I did not really expect this to impact my observations as much as they have. I think that this relationship between leaf nitrogen content and maximum photosynthetic rate is very interesting. Now I have to sit and figure out what factor(s) might be contributing to this relationship. Shucks, I wish I knew why this relationship was so statistically tight and linear.



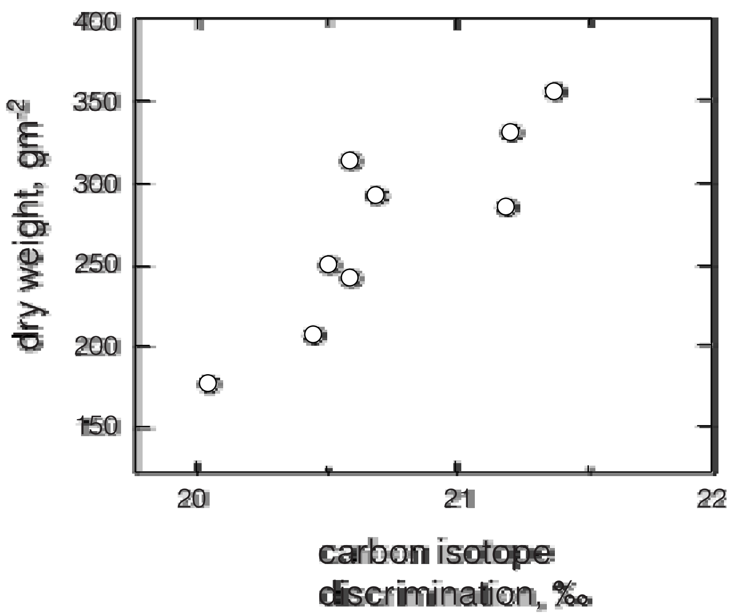
Now that I have had a chance to analyze more of the amaranth photosynthetic data, I realize that there is an interesting relationship between the observed leaf photosynthetic rate and leaf conductance. I did a good job when conducting these experiments in keeping atmospheric CO_2 constant at 350 ppm. I remember from old Professor Ehleringer's lectures that there was an expected relationship between CO_2 inside and out of a leaf, photosynthetic rate, and leaf conductance. Uhmmmm, uhmmmm, I wish I could remember whose electrical analogy law he was referring to. Oh well, when I get around to writing up these data I am sure I'll remember his name and that relationship.



My sister Wanda had a few days free last week and she came up to collect light quality measurements on the amaranth crops. She has this new instrument that allows her to measure specific wavelengths. Shew has been measuring the light quality through canopies and sees a very interesting pattern with measurements at 660 nm (red) and 730 nm (far red). The most interesting observation she has made is that the growth patterns within the amaranth canopy change with light quality. You know it is almost as if plants had a built in light meter. What could possibly contribute to these changes in light quality and why would internodal distance change with light quality? I am sure that this pattern means nothing, but we did have one heck of a good time collecting data.



Well, you know you can't spend all of you time thinking about new crops. I still have to work with the crop breeders to develop better wheat varieties for growth in Utah. I had sent off some of my leaf samples for different wheat cultivars to the University of Utah. You know they conduct stable isotope analyses there. I had not expected that the carbon isotope discrimination should be so linearly correlated with plant size. Wanda's friend Bill claims that this correlation occurs because of stomatal characters, while her other friend claims that this pattern is due to nutritional characters. And still another friend, Michelle, claimed that this pattern was just a coincidence - she claims that there is no reason to expect the parameters to be related.



Now I really screwed up. I sent off four samples to the University of Utah for carbon isotope analyses. They sent me back the four carbon isotope ratio values shown below:

sample 1	-29.1 per mil
sample 2	-25.8 per mil
sample 3	-16.2 per mil
sample 4	-15.9 per mil

I am like totally embarrassed. I know that the samples consisted of either amaranth or wheat. Two of the samples were from leaves grown under well-watered conditions and 2 were from leaves grown under limited-water conditions. Now, if I can get a few minutes I am sure that it will be easy to figure out which is which. But even after I do that, how am I going to know how the ci/ca ratios changed in wheat in response to the water when all that I now know is that the atmospheric CO_2 had a value of -8 per mil?