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Fluorescent Flowers: A Long Road to Accomplishment

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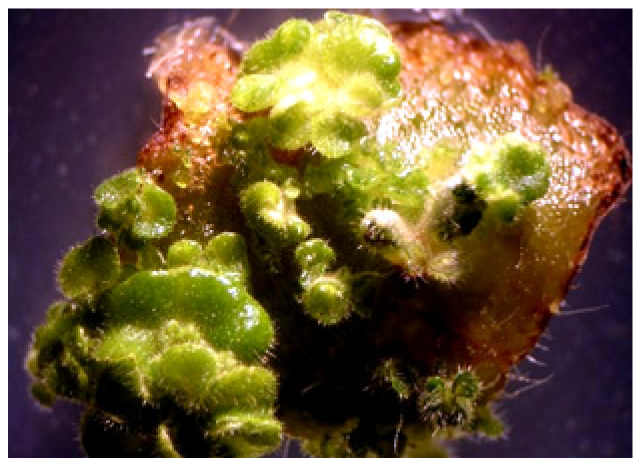
commentary

Fluorescent Flowers: A Long Road to Accomplishment

—Lindsay Kendrick

Sometime in December of 2004—I should really remember the date—I realized there was no better feeling than that of accomplishment. I was standing in a basic cell culture room in Rudman Hall, where fluorescent bulbs lit up Petri dishes containing plant cultures of all kinds. Tiny sprouts of new tissue grew from the five sections of leaves I had cut and placed on the simple agar only weeks before. Perfect little clones, they were bright green like new plants in the spring. I was only a month into my independent study in the plant biology department and nowhere near the completion of my project to create fluorescent African violets, but I will never forget the sense of pride that swept over me that day.



My research began as a side project in Dr. Subhash Minocha's lab. I had taken a course with him the previous spring, and asked if I could work on a project in his lab for university credit. He proposed a project working with African violets and a substance called Green Fluorescent Protein (GFP). My first step was to research GFP and, with Dr. Minocha's help, design a project.

I began my research immediately. GFP, I learned, is a valuable tool for many scientists worldwide, and it has many functions. The gene for GFP is harvested from a jellyfish that glows in the dark, and it can integrate itself into the DNA of plants. One way scientists use GFP is to monitor the transfer of DNA from one organism to another via pollination and reproduction. Another potential use of GFP is to help farmers become aware of their crops' nutritional needs by making the plants glow under adverse conditions.

I designed my project to aid the study of the GFP gene expression in African violets with the goal of producing fluorescent flowers and/or plants. My first objective was to produce genetically-engineered African violets that expressed a GFP gene in their flower petals by glowing under low UV light. My second objective was to study the expression pattern of the GFP gene in different parts of the plant. Unfortunately, I did not accomplish either of these goals before my time in the lab was over.

I also hoped that a third objective would be met during the course of my research. Showing others that a genetically-modified organism, such as a flowering plant, could be produced without causing harm to people or the environment might help to change the perspective of those who are skeptical of genetic engineering. My project had the potential to show that genetic engineering is not something to be feared or condemned; I sincerely hope I accomplished this.

Dr. Minocha showed me how to create new, sterile plants from grown African violets using tissue culture techniques, and then left me to do the work on my own. He warned me that my cultures would be mostly contaminated until I perfected the sterile technique; however, the procedure seemed so simple that while I was performing the cultures, I expected to exceed his initial expectations. I wanted so badly to impress Dr. Minocha right out of the gate. Instead, his predictions were right on. My first set of cultures was 80% contaminated. The rest of the leaf sections dried up and died before they sprouted. It was the first time I had done lab work on my own, and the sense of responsibility was overwhelming.

I was surprised that—given the straightforward procedure—my cultures were not as sterile as I assumed they would be, but Dr. Minocha was not disappointed by my debut performance in the lab. He instructed me to keep at it. He was sure that those numbers would improve, and he was right. My second set was only 50% contaminated, and it was this set that showed me my first new tissues.

It was around this time that Dr. Minocha suggested I apply for an Undergraduate Research Opportunity Program (UROP) grant. I knew that it would be good practice for future grant writing and, if I was awarded a grant, it would help prepare me for future success in graduate school or in my career. I was awarded a two-semester grant, and continued to work diligently on my plants.

By the time the spring semester rolled around, I was ready to begin working with the GFP. I learned how to grow the appropriate agrobacterium, or *agro,* that would transfer the GFP gene to my plant tissues, as well as how to perform the actual transfer. The GFP had already been incorporated into the genome of the agro, along with a gene for antibiotic resistance, so by growing the bacteria on my plants, the gene could then be transferred to the genome of the plant. It was not a foolproof method by any means; it was possible that the gene would not be taken up by my plants at all.

After the transfer, the leaf section was treated with strong antibiotic. If the transfer was a success, the whole leaf would die except for the cells to which the agro had transferred the GFP and the antibiotic resistance. That was precisely what happened to my plants; I had finally experienced success in the lab. It then became time to think about the poster presentation I was going to give at the Undergraduate Research Conference.

What I did not realize was that creating a poster that succinctly explained my research would be much more difficult than simply talking about it. I had to condense an eight-page report into a few key points that would not be too complex for a student or parent, but not too simple for a biology professor. It had to convey the essence of my research, the details of my research, and my results (or lack thereof).

For weeks Dr. Minocha and I emailed ideas back and forth. First we discussed the information that needed to be on the poster—where each section should go and which pictures we should include—in addition to more general considerations such as the color scheme and size of the poster. Then we designed the poster on a PowerPoint slide. Throughout this process, we discussed and debated every single aspect of the presentation.

By the time the poster was printed, I felt as though I knew my research more thoroughly because I had gone over it in such detail while working out the design. My newfound confidence was unexpected, but exactly what I needed only days before the conference.

The day of the conference I was nervous, but I told myself that I knew my research better than anyone else. My poster was beautiful, and it showed great pictures of my growing plants. I mustered up all the courage I could and answered my audiences' questions to the best of my ability. I even kept my knees from shaking right up to the end. The sense of accomplishment I felt that day in the culture room rushed back to me after completing my poster session at the conference.

The following summer I decided to allow another member of the Minocha lab to take over my project so that I could focus on my major, animal science. It was difficult to leave the lab without seeing my plants fluoresce, but I had succeeded in so many ways. I completed numerous hours working independently in a lab, successfully grew new plants from tissue culture, and conquered my fears to stand confidently in front of an audience and present my research. People were impressed by my work; even more so, I was impressed.

I would like to acknowledge Dr. Minocha for his patient mentoring, as well as the Minocha lab for their guidance.

Author Bio

***Lindsay Kendrick**, from Franklin, NH, is an animal science/pre-veterinary medicine major who graduated in December 2005. While many students choose to conduct research in their field of study, Lindsay went outside her major to pursue research in plant biology. Inspired by a biotechnology course with Dr. Minocha, she became interested in genetic engineering and designed her project with his assistance. "I didn't know anything about Green Fluorescent Protein (GFP) or genetic engineering before the project, so I learned how it worked and that it was actually not a complicated process at all." Lindsay found the most difficult part of the research process to be turning over her project to another student for completion, and she was pleased to find closure with the writing of her commentary. Lindsay plans to attend veterinary school in the near future.*

Mentor Bio

*Dr. **Subhash Minocha** is a professor of plant biology and genetics, specializing in plant molecular biology, plant genetic engineering, and plant growth and development. He has taught at UNH for over thirty-one years, and is the author of over ninety publications appearing in academic journals, books, and proceedings. Over the past five years, Dr. Minocha has been very active as a mentor, working with more than thirty undergraduate students on research projects, many of which have been funded through the Center for Undergraduate Research. "It is always fun to have students who are either utterly confused or are really excited about doing research. The challenges in both cases are similar and so are the outcomes. While doing research (i.e., the mechanics of it) may not sound that exciting, it is when you succeed that the excitement builds up."*