



Ohio State HCS News

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Kiplinger Petunia Microarray: A Floriculture Resource



As Kiplinger Chair, Tony Stead studied the genetics of flower senescence and developed a petunia microarray.

Established in 1977 to honor Ohio State's Horticulture & Crop Science Department faculty member D.C. "Kip" Kiplinger and his 40-year leadership and contributions to the floriculture industry, the [D.C. Kiplinger Chair](#) strives to promote Ohio State floriculture research, perpetuate departmental programs and advance the national impact of university research and education.

In 2004 [Dr. Anthony "Tony" Stead](#), a Senior Lecturer in Plant Biology at Royal Holloway, University of London, UK, was named the D.C. Kiplinger Chair in Floriculture and conducted a research sabbatical in the laboratory of [Dr. Michelle Jones](#) in the Horticulture & Crop Science Department. The research project conducted by Drs. Stead and Jones investigated flower senescence in petunias and daylilies. The results of this research furthered the basic understanding of the molecular regulation of flower development by identifying genes controlling senescence, the last stage of development that results in plant death.

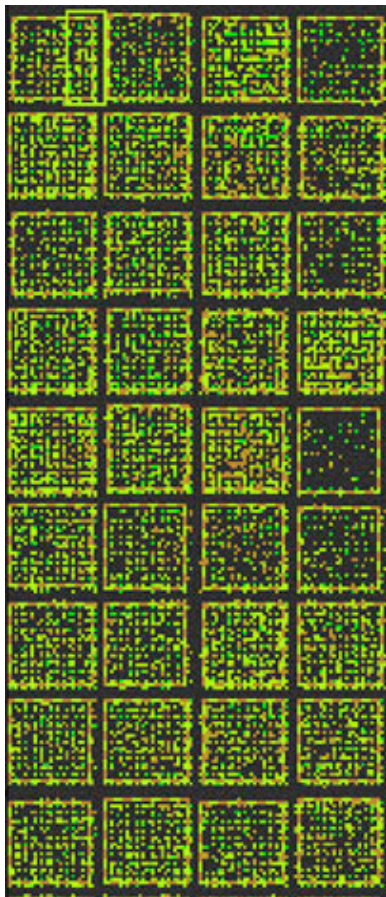


The D.C. Kiplinger Petunia Microarray was developed while Tony Stead was on a research sabbatical in Michelle Jones' Floriculture Molecular Biology Lab.

"Identifying genes that control senescence will allow us to create plants with delayed senescence using genetic engineering or classical breeding and to recommend environmental conditions, proper shipping and handling procedures and/ or chemical treatments that will enhance plant quality by delaying senescence," explains Jones, a floriculture molecular biologist. "Identifying the genes that regulate senescence provides a substantial contribution to the advancement of Floriculture, but the tool that was developed within this project to identify these genes will have a more far reaching impact on the

industry. A major component of this project was the creation of a Petunia DNA microarray, a resource that will be used by floriculture researchers for gene discovery and crop improvement experiments for years to come."

Microarrays are one of the latest and greatest new technologies used by molecular biologists for gene discovery on a grand scale. Hundreds of genes and their products (i.e. RNA and proteins) interact in a complicated but well orchestrated way to control plant growth and development. Traditionally, molecular biologists have taken snapshots of these processes by investigating a single gene in an experiment. DNA microarrays allow researchers to investigate many hundreds or even thousands of genes in one experiment, providing scientists with "the big picture".



"The identity of the genes within a particular tissue at a given developmental stage or following a specific treatment allows us to determine the metabolic processes occurring in the plant at that time. For example, microarrays can be used to identify genes that are turned on in flowers and not in leaves or genes that are turned on in drought stressed but not in non-stressed plants. These experiments can be used to identify the genes that control specific plant responses, and this knowledge can be used by researchers to control or modify these responses," noted Jones.

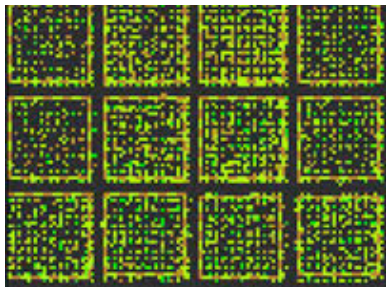
The D.C. Kiplinger Petunia Microarray contains 4500 unique genes from petunia leaves and flowers. The microarray itself is a glass microscope slide, onto which genes have been spotted at a very high density. The spots may include the entire gene sequence (the complementary DNA itself) or an oligonucleotide probe that has been designed to be unique to the sequence of a single gene. The microarray contains oligonucleotide probes that are 70 base pairs in length (a base pair is the individual unit of a DNA molecule). A team endeavor, the microarray development was made possible by the petunia gene sequencing efforts of [Dr. David Clark](#) at the University of Florida. Scientists at The Institute for Genomic Research analyzed these sequences and designed the 70 base pair sequences (the probes that were printed on the slides) that are unique to the 4500 petunia genes.

Initial experiments with the D.C. Kiplinger Petunia Microarray have been conducted to identify genes involved in regulating flower senescence. This microarray can also be used by researchers to investigate many responses that are of importance to the floriculture industry, including floral scent, drought tolerance, flower initiation, or seed germination. Identifying genes involved in a specific plant response allows researchers to use genetic engineering to modify that response and create an improved product for the industry. While genetic engineering can be used to modify metabolic pathways and create both improved and unique products for the industry, a better understanding of the biochemistry of plant growth and development can lead to the development of chemical products that will more efficiently modify or improve growth.

"We chose to create a petunia microarray because Petunia is a model system for basic floriculture research. Many genes have been sequenced and cloned from this Genus, petunia can be genetically engineered, and the plants are easy to grow and propagate. The D.C. Kiplinger Petunia Microarray is a resource that can be used by scientists for the future advancement of the floriculture industry, and the knowledge obtained from experiments using the Petunia Microarray should be transferable to other floriculture crops of interest," Jones explained.

"The endowed chair was established to recognize Kip's instruction, research and Extension efforts, which created a solid foundation on which Ohio State's current floriculture faculty continue to build," said Jones, the chair of the D.C. Kiplinger Advisory Committee. "The floriculture industry has a big investment in the endowment as the D.C. Kiplinger Chair helps boost interest in the floriculture industry and interest in promoting the industry."

With floriculture production in Ohio a growing \$180 million industry and ranked 6th in



Petal senescence experiment using the D.C. Kiplinger Petunia Microarray.

the nation, it takes the commitment and expertise of the Ohio State University Floriculture Program to keep the university at the top of floriculture Extension, education, and research. The OSU Floriculture Program is one of the few in the nation that provides producers, breeders and consumers the research, education and technical skills to improve cultivation and management and the plant performance of ornamental and flowering plants.

Story by Michelle Jones, Candace Pollock and Victor van Buchem. Web publishing by [Victor van Buchem](#). Photos courtesy [Michelle Jones](#) and Tony Stead. Portions of this article are reprinted with permission from the [OFA Bulletin](#), September/October 2006, Number 898.

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