

IMPACT

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IMPACT is a series of publications highlighting how UC Davis' College of Agricultural and Environmental Sciences makes a difference in the lives of Californians. Through research, teaching, and outreach programs, UC Davis research touches almost all aspects of Californian life. Today, millions of people eat safer foods, breathe cleaner air, and drink healthier water with the help of our researchers. We're making discovery work -- for California and the world.

IDENTIFYING STRAWBERRY VARIETIES

THE ISSUE

Strawberries are one of the top 10 agricultural crops in California with a fresh market value of more than \$1 billion per year. With improvements in production practices and the breeding of new varieties, strawberries are now harvested 11 months of the year in California, and production acreage continues to grow. Consumers are able to obtain high-quality fresh strawberries most of the year.

The University of California, Davis, has a long history of working with the California strawberry industry to improve production practices and provide new strawberry varieties. The yield of strawberry production has increased from 2 tons per acre in 1920 to 32 tons per acre in 2003. The number of acres in strawberry production has increased ten-fold during this same period, with approximately 30,000 acres now in strawberry production in California.

New strawberry varieties are regularly introduced to the strawberry industry, with no single variety dominating the market. More than 80 percent of the strawberries produced in California are from UC Davis varieties. Professor Douglas Shaw and specialist in Cooperative Extension (CE) Kirk Larson are two UC Davis scientists who breed new strawberry varieties for the strawberry industry.



Ann Filmer / UC Davis

Strawberry growers rely on UC Davis Foundation Plant Services (FPS) to provide nurseries with virus-tested, correctly identified planting stock of the newest and best UC-patented strawberry varieties. Historically, there has been no objective screening test to accurately distinguish varieties. In response to industry and consumer needs, UC Davis scientists developed a DNA “fingerprinting” methodology to correctly identify strawberry varieties.

WHAT WE'RE DOING

Developing a DNA fingerprint. Gerald Dangl, a researcher at Foundation Plant Services -- in cooperation with student researcher Elaine Lee and CE specialist Deborah Golino, FPS director -- developed a system to use genetic markers,

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“DNA fingerprints,” to uniquely identify the variety of a given strawberry plant.

Identifying plant varieties. In the fingerprinting process, DNA is extracted from fresh strawberry leaves, then specific marker DNA is amplified using polymerase chain reaction. The amplified marker DNA for each strawberry variety is unique, just like a human fingerprint. By analyzing the marker DNA and comparing the results to a newly developed database of strawberry DNA fingerprints, researchers can determine a strawberry plant’s varietal identity.

Creating a strawberry database. Dangl and his colleagues at FPS collaborated with Professor Douglas Cook and scientist Jong-Min Baek at the UC Davis Central Genomics Facility where expertise and advanced high throughput equipment are available to support researchers in many types of genomics research. The genetic markers used were selected from a set of markers initially characterized at the U.S. Department of Agriculture ARS Fruit Lab in Beltsville, Md., and provided by research scientist Kim Lewers.

Based on the success of this methodology, Dangl created a DNA fingerprint database of more than 40 strawberry varieties, including all of the current UC-patented strawberry varieties. This technology is now routinely used as a quality control measure at FPS and is also available to the private sector for agricultural application.

Similar plant varietal identification systems for grapes and walnuts are available through

Foundation Plant Services. This has had a tremendous impact on the ability of grape and walnut propagators to determine that their planting stocks are correctly identified.

A SHARED VISION

This system to correctly identify strawberry varieties through DNA is a very practical technology developed from basic genomic work. It was a collaborative effort among several UC Davis programs, the California strawberry industry, and the U.S. Department of Agriculture.

This new technology will insure that Foundation Plant Services, research scientists, and the strawberry industry have correctly identified planting stock. Nurseries produce millions of dormant plants for growers from single plants purchased from FPS. Mistakes in any part of the plant production process can result in mix-ups which can be devastating to a grower’s production. With the new fingerprinting system, it is possible to conduct variety testing for quality control at every stage of the plant production process. This will help assure that growers receive the high quality plants that are key to strawberry production.

That’s impact -- UC Davis scientists in the College of Agricultural and Environmental Sciences adapting basic research to agricultural production, resulting in better farm products for California consumers.

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