



# SolCAP

Solanaceae Coordinated Agricultural Project



Volume I, Issue I

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## Inside this issue:

<i>SolCAP Award</i>	1
<i>Dave's Perspective</i>	1
<i>Participants</i>	2
<i>SolCAP WebSite</i>	3
<i>Origins</i>	4
<i>Calendar</i>	5

### SolCAP

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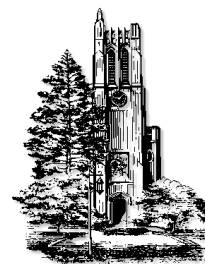


## USDA-CSREES AWARDS \$5.4 Million to SolCAP

Michigan State University was awarded more than \$5 million for a Coordinated Agricultural Project (CAP) to study specialty crops within Solanaceae, including potato and tomato. The Solanaceae Coordinated Agricultural Project (SolCAP) <http://solcap.msu.edu> brings together an integrated team of researchers, educators and extension specialists at Michigan State University, The Ohio State University, Cornell University, University of California at Davis and Oregon State University to incorporate emerging DNA-

sequence data into efforts to improve vegetable crops. Potato and tomato are the two most important vegetable crops in Solanaceae, a taxonomic family that includes pepper, eggplant, and petunia. The project will identify DNA sequence variation in genes associated with high value traits, such as carbohydrate and vitamin content and link these traits with breeder friendly markers. SolCAP will support centralized facilities (at Ohio State and UC Davis) for generating transcribed sequence data and then characterizing DNA

sequence variation (up to 1536 SNPs) in relevant potato and tomato lines. Colleagues at Oregon State University, USDA/ARS Idaho, Harris-Moran Seeds, University of Florida, Ohio State, USDA/ARS WI, Cornell, University of Minnesota, North Carolina State and USDA/ARS Maryland will manage the field trials of these potato and tomato lines. SolCAP will also support a database hosted by (see page 2)



## Dave's Perspective:

The SolCAP team is pleased to announce that the USDA/NRI Plant Genome program has funded its fifth Coordinated Agricultural Project (CAP) and the first one focused on vegetable crops. Our four-year grant is titled "**SolCAP: Translating Solanaceae sequence diversity and trait variation**

**into applied outcomes through integrative research, education, and extension**". We will focus on the two most significant Solanaceae vegetable crops produced in the U.S.: potato and tomato. SolCAP addresses the CAP program priority "improvement of U.S. crop production through the application and (see page 3)



## SolCAP award cont'd....

the Solanaceae Genomics Network (at Cornell) to access, curate and share information pertinent to breeding programs. A small grants program will be used to leverage the centralized genotyping of mapping populations so that agronomic, disease/insect resistance and quality traits can be linked with SNPs by the potato and tomato research and breeding communities. SolCAP scientists will also develop a distance education course for graduate students, of-

fer workshops and practical training for plant breeders at national meetings, and develop a community of learning for breeders and extension specialists via the eXtension web portal at Oregon State. SolCAP will also provide leadership to the rice, wheat, barley and conifer CAPs to create a broad eXtension community of practice. By providing tools to identify and manipulate key genes, SolCAP will accelerate the development of varieties with enhanced qual-

ity, nutrition, and resistance to diseases and insects, thus benefiting both consumers and the environment.



## SolCAP Participants:

### Executive Committee:

David Douches	Michigan State University
Robin Buell	Michigan State University
Walter De Jong	Cornell University
David Francis	Ohio State University
Allen Van Deynze	University of California, Davis
Lukas Mueller	Cornell University
Alex Stone	Oregon State University

### Extension/Education Board:

Deana Namuth Covert	University of Nebraska
Deborah Lewis	Ohio State University Ext.

### Collaborators:

Roger Chetelat	University of California, Davis
Jay Scott	University of Florida
Nankui Tong	Campbell's R&D
Richard Novy	USDA/ARS, University of Idaho
Shelley Jansky	USDA/ARS, University of Wisconsin
M. Isabel Vales	Oregon State University
Craig Yencho	North Carolina State
Christian Thill	University of Minnesota
Kathleen Haynes	USDA/ARS Beltsville, MD
Barbara Liedl	West Virginia State University

### Stakeholder Advisory Board

Robert Hoopes	Frito-Lay, Inc.
Erik Legg	Syngenta
Thomas Osborn	Seminis Vegetable Seeds, Inc.
Charles Rivara	California Tomato Research Institute
Caius Rommens	J.R. Simplot Company

### Scientific Advisory Board:

Glenn Bryan	Scottish Crops Research Institute
Jim Giovannoni	USDA/ARS Cornell University
David Neale	University of California, Davis
Dani Zamir	The Hebrew University of Jerusalem

### SolCAP Project MSU:

Kelly Zarka	Michigan State University
Kim Felcher	Michigan State University



## Dave's Perspective cont'd:

translation of genome-wide discoveries and high-throughput technologies for traditional breeding practice”.

Three years ago the Solanaceae community came together at UC Davis to see if the community of breeders and genomic scientists could work toward the improvement of our important crop species. Through workshops and meetings held since then we have identified high priority needs in research, education and extension. Our planning process has revealed a need to balance goals that are generalized for two distinct crop species and several markets, while providing resources to accomplish specific objectives with impact.

Potato and tomato are linked by the central importance of carbohydrate and sugar metabolism pathways to quality traits associated with fresh market and processing end uses. We will use bioinformatics and high throughput sequencing to characterize candidate genes and define allelic variation in respective species. A centralized platform for SNP genotyping will be implemented. Germplasm panels consisting of 480

relevant varieties, parents, breeding lines, and mapping population progeny have been defined to identify genotypic and phenotypic variation useful in U.S. breeding programs for both potato and tomato. We will exploit existing expertise and bioinformatics infrastructure to enhance access and availability of information to breeders. To address community input about the importance of balancing consensus traits with specific needs, we will use flexible funds for a small grants program that ensures community access to the SolCAP genotyping platform for regional, crop-specific, and emerging traits and needs.

Educating students and communicating with breeders and genomicists in the integration of new technologies and traditional methods will be accomplished through development and delivery of curriculum designed for short workshops and innovative university distance education courses. Extending outreach to the wider breeding community will be accomplished through extension curriculum using eXtension.org and developing a Community of Practice (CoP) for plant breeding and the use of genomic tools. Sol-

CAP will also be the lead for all the CAPs (Rice, Wheat, Barley and Conifer) to develop this CoP. The effectiveness of these education and extension activities will be evaluated and improved through cooperation with an extension evaluator.

We will coordinate our efforts through a management structure that includes 1) stakeholder, scientific, and extension advisory boards, 2) project director, 3) an executive committee, and 4) team leaders for genotyping platforms, data management, germplasm resources, education, and extension that will be drawn from the Co-PDs, and cooperators. Dr. Michael Coe will serve as our external consultant to provide evaluation services aimed at improving and documenting the impact of our proposed education, and extension outcomes.

We look forward to an exciting four years putting the SolCAP translational genomics vision into practice for our potato and tomato communities.

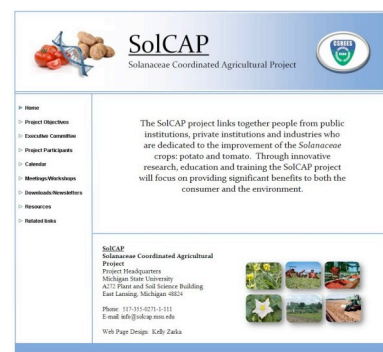
## SolCAP WEBSITE

Check out the new SolCAP web site! Kelly Zarka the SolCAP project assistant has created and will maintain the project web site. As our project continues to grow the site will be expanded. We hope to create a site that will contain up to date information, databases and links for the SolCAP community and beyond.

One of the features on our SolCAP websites is a link to a page of downloads. These downloads are

offered to provide uniformity for presentations, posters, publications, etc. for our project. Currently you will find the SolCAP logo in various forms and a SolCAP power point lead slide and background slide.

We are planning on including a full SolCAP summary power point presentation shortly. As our project progresses we plan on including a SolCAP brochure, SolCAP displays, etc. which can be downloaded, printed and dispersed.



Please visit us at  
<http://solcap.msu.edu>

## Potato Origins

The potato (*Solanum tuberosum*) originated approximately 8,000 years ago in the Andes of South America. Early Spanish explorers brought it to Europe in the 16th century. Wild potato species occur from the United States to Chile. Genetic testing of the wide variety of cultivars and wild species suggest that the potato has a single origin in the area of southern Peru, from a species in the *Solanum brevicaulis* complex. Today, over 99% of all cultivated potatoes worldwide are descendants of a subspecies indigenous to south-central Chile. Based on

historical records, local agriculturalists, and DNA analyses, the most widely cultivated variety worldwide, *Solanum tuberosum tuberosum*, is believed to be indigenous to Chiloé Archipelago where it was cultivated by the indigenous people.

The potato is the world's No. 4 food crop (following maize, wheat and rice.) In 2006 almost 315 million tonnes (347 million US tons) were produced worldwide.

Although all cultivated potatoes belong to just one botanical species, *Solanum tuberosum*, they come in thousands of varieties

with great differences in size, shape, color, texture, cooking characteristics and taste. The International Potato Center (CIP) holds 7,500 different varieties of potato (1,950 of them wild). More than 5,000 native varieties still grow in the Andes in South America.

Source: (<http://www.potato2008.org/en/index.html>)

<http://en.wikipedia.org/wiki/Potato>



(Wild potato varieties.)

Picture provided by David Douches

## Tomato Origins

The history of tomato domestication and breeding have been extensively reviewed (Boswell, 1937; Jenkins, 1948; Walter, 1967; Rick, 1995). The center of origin is Andean Peru and Ecuador. In this region there are several sympatric species, with the red-fruited *Solanum pimpinellifolium* and *S. lycopersicum* var. *cerasiformae* the most likely progenitors of the first domesticated varieties. Tomato was domesticated in the Americas, most likely in Mexico, though an origin in Peru has also been postulated. Genetic bottlenecks accompanied its development as a crop with a limited number of varieties being introduced into Europe following the

"discovery" of the new world. Large-fruited landraces were in existence at this time (Jenkins, 1948), and one explanation for their development is the accumulation of mutations (Tanksley, 2004).

French botanist Tournefort provided the Latin botanical name, *Lycopersicon esculentum*, to the tomato. It translates to "wolfpeach" because it was round and luscious and wolf because it was erroneously considered poisonous.

125 million tons of tomatoes were produced in the world in 2005. China, the largest producer,

accounted for about one-fourth of the global output, followed by United States.

There are many, around 7500, tomato varieties grown for various purposes all over the world.

Source: UN Food & Agriculture Organization (FAO)



(Heirloom tomato varieties.)

Picture provided by Dave Francis

## Factoid:



While the tomato was once called the "love apple",



the potato was once called the "Devil's apple".

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## Calendar of Events:

- North East Regional Potato E1031 Meeting will be Dec 18-19, in Raleigh, NC
- Global Potato Conference, December 9-12, 2008, New Delhi, India
- Potato Expo 2009, January 7-9, 2009, San Antonio, TX
- Plant and Animal Genome XVII Conference, January 10-14, 2009, San Diego, CA
- North Central Potato Breeding and Genetics Technical Committee Meeting NCCC84, January 26-27, 2009
- The 43rd Tomato Breeders Round Table will be held on June 28th through July 1st , 2009 at the Embassy Suites, Sacramento.
- Potato Association of America (PAA) 93rd Annual Meeting, Fredericton, New Brunswick, Canada Aug 9-13, 2009



The SolCAP project was supported by the National Research Initiative Plant Genome Program of USDA's Cooperative State Research , Education and Extension Service