

Peanut CRSP Final Report for Project UF150, 2008-2012

Title: Breeding Peanut for Disease Resistance Valuable to the United States, Latin America and the Caribbean

1. Final Summary

a. Overall goal

The overall goal of the project was to develop peanut germplasm with resistance to both leaf spot and rust while offering training to both graduate students and professionals. Leaf spot and rust are two major peanut diseases found in nearly all tropical areas of the world where peanut is produced. The overall goal was embodied by three specific objects as follows:

Objective 1: Develop rust and leaf spot resistant germplasm for the region - based on parallel activities in the USA and Bolivia.

Objective 2: Train graduate students from the host country, or other Caribbean or Latin American countries.

Objective 3: Train host country collaborators to evaluate peanut plants for rust and leaf spot resistance and to select and propagate those plants that show promise.

b. Significant Technical Achievements

The discovery of several lines possessing resistance to both rust and leaf spot is a significant achievement. Confirmation of these results is needed in the target environments, but is supported by three years of field work in two locations in the southern USA. Two graduate students, Ms. Imana Power and Ms. Alyssa Cho are completing dissertation research to evaluate germplasm for its resistance to leaf spot and rust.

In addition to long term germplasm enhancement, the cultivar 'Cordillera' was released for production in Bolivia. Cordillera has very good resistance to leaf spot as well as good agronomic characteristics.

b. Significant Issues and Challenges

The exchange of germplasm remains a challenge and the bureaucracy of seed importation delayed receipt of material (from the USA) in Bolivia for a season. Regardless, the seed arrived and was planted. Optimum conditions for disease development can be a challenge as well. Of the four locations planted in Bolivia, only one had rust.

c. Physical Capacity Development (e.g., lab, field, equipment)

Not applicable to this project

d. Human Capacity Development

a. Long-term training.

Name	Gender	Origin	Degree	Completion Date	Training Location	Employment
Imana Power	Female	Suriname	Ph.D.	Expected in May 2014	University of Georgia	
Pablo Navia	Male	Bolivia	M.S.	August, 2012	University of Georgia	Private company in Georgia

b. Workshops and Short-Term training

Training Location	Training Type	Participants-Name or Number	Gender	Origin	Training Dates
University of Florida	Short-term, Visiting Scientist	Diego Baldelomar	Male	Bolivia	August-October 2010

e. Publications

Refereed Journal Articles

None to date

Abstracts and Proceedings

- Gine, P. A. N., A. K. Culbreath, T. C. Strickland, and C. M. Smith. 2013. Visual assessments and canopy reflectance for monitoring disease progress of leaf spot diseases of peanut. *Phytopathology* 103:8-8.
- Power, I. L., R. S. Arias, and A. K. Culbreath. 2013a. Genetic polymorphism of *Puccinia arachidis*. *Phytopathology* 103:115-115.
- Power, I. L., B. L. Tillman, C. C. Holbrook, P. Ozias-Akins, Y. Chu, R. S. A. De Ares, and A. K. Culbreath. 2013b. Molecular diversity of the peanut rust pathogen and its host. *Phytopathology* 103:9-9.

2. Final Interpretation

a. Importance of Technical Achievements

Germplasm lines with resistance to rust and leaf spot that also have good agronomic characteristics is an important technical achievement. Seven F₂ populations derived from germplasm lines discovered in this project were grown and harvested based on pod shape in 2013. These populations will form the nucleus for future improvement and potential cultivars release.

b. Importance of Physical and Human Capacity Achievements

Three graduate students devoted at least part of their thesis/dissertation research to parts of this project. Apart from the technical achievements, they are poised to make contributions to the communities they serve both in the short-term and long-term. In the short-term, publications arising from their research will benefit both scientists and practitioners.

c. Heritage left from workshops and short-term training

Mr. Diego Baldelomar is the principle plant breeder in ANAPO in Bolivia. He breeds soybean, peanut and wheat and benefited from first-hand exposure to UF's large peanut breeding program as well as short visits to the USDA in Griffin, GA and the University of Georgia in Tifton, GA. This exposure will help him to improve the breeding processes employed in Bolivia.

d. Heritage left in Publications

N/A

3. Final Summary of Accomplishments by Objective

Objective 1: Develop rust and leaf spot resistant germplasm for the region - based on parallel activities in the USA and Bolivia.

Achievement:

Initial genotype screening for rust and leaf spot resistance occurred in 2008 and 2009 with 48 and 90 lines, respectively. During 2010-2012, a subset of 22 selected lines was tested in a replicated trial in Florida, USA managed by a Ph.D. graduate student, Imana Power with the University of Georgia. Based on the 2010 results, seven lines were included in rust and leaf spot screening in Guyana in 2011 by Alyssa Cho a Ph.D. graduate student with the University of Florida. Work in Guayana continued in 2012 and in 2013 in Florida. Based on Ms. Power's results, at least three of the experimental lines have resistance to both rust and leaf spot. These lines were placed in crossing nurseries in 2011 and 2012. Five new populations were created from 2011 crossing and two in 2012. F₂ plants were grown in the field in 2012 from the 2011 crosses. In addition, 44 lines were sent to Bolivia for evaluation during the 2011 and 2012

seasons. The 2011 season produced little or no leaf spot or rust. Results from the 2012 season are still being evaluated. We have also requested several putative rust/leaf spot resistant lines from ICRISAT. These lines were grown in quarantine by Dr. Noelle Barkley of the USDA-ARS in Griffin, GA and will be available in the 2013 or 2014 growing season. We expect that the project will continue for another five years and that the breeding material will be evaluated for rust and leaf spot resistance as well as agronomic characteristics such as yield and grade with the goal of releasing at least one cultivar with superior characteristics.

Objective 2: Train graduate students from the host country, or other Caribbean or Latin American countries.

Achievement:

Two graduate students have been working in the project, one MS and one PhD. Mr. Pablo Navia from Bolivia recently completed and defended his MS Thesis entitled "CHARACTERIZATION OF THE RELATIONSHIP BETWEEN LEAF SPOT SEVERITY AND YIELD IN NEW PEANUT RUNNER-TYPE CULTIVARS AND EFFECTS OF NEW PEANUT GENOTYPES ON LEAF SPOT EPIDEMICS". Ms. Imana Power has successfully completed her qualifying exams and is a candidate for the Doctoral Degree. Both are in the Plant Pathology Department at the University of Georgia under the direction of Dr. Albert Culbreath. Ms. Imana Power, from Suriname, is working on peanut rust (*Puccinia arachidis*) as part of the CRSP project. She is in the process of characterizing multiple isolates of *Puccinia arachidis* from Bolivia, Guyana, Nicaragua, Haiti and the U.S. for genetic variability. She has conducted field trials in Tifton, GA and Citra, FL evaluating field resistance to *P. arachidis* in approximately 20 peanut cultivars and/or breeding lines. She has also aided in compilation of results of rust reactions of peanut genotypes in Guyana and Haiti, as well as the Bolivia locations listed above. Ms. Power has presented her findings at the 1st Field Crops Rust Symposium, in San Antonio, TX, in Dec. 2011, the APS Southern Division meeting in 2012, and was selected as a Melhus Symposium speaker for the symposium titled "Host Plant Resistance and Disease Management: Current Status and Future Outlook". Ms. Power has developed techniques for determining components of resistance to the rust pathogen on detached peanut leaves and is evaluating numerous lines using that technique.