

3-19-2014

Potato Breeding and Variety Development for Improved Quality and Pest Resistance in the Eastern United States

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Recommended Citation

Porter, Gregory; Alyokhin, Andrei; Lambert, David; Halseth, Donald; Yenko, G.; Jemison, John; Freeman, Joshua; Perry, Keith; Perkins, L. Brian; Zotarelli, Lincoln; Clough, Mark; Camire, Mary; Kleinhenz, Matthew; Dufault, Nicholas; Veilleux, Richard; De Jong, Walter; and Qu, Xinshun, "Potato Breeding and Variety Development for Improved Quality and Pest Resistance in the Eastern United States" (2014). *University of Maine Office of Research and Sponsored Programs: Grant Reports*. 31.
https://digitalcommons.library.umaine.edu/orsp_reports/31

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Title:	Potato Breeding and Variety Development for Improved Quality and Pest Resistance in the Eastern United States		
Sponsoring Agency	NIFA	Project Status	COMPLETE
Funding Source	Non Formula	Reporting Frequency	Annual
Accession No.	226231	Grants.gov No.	GRANT10810003
Project No.	ME0-2011-02111	Proposal No.	2011-02111
Project Start Date	09/01/2011	Project End Date	08/31/2013
Reporting Period Start Date	09/01/2011	Reporting Period End Date	08/31/2013
Submitted By	Charlene Herrick	Date Submitted to NIFA	03/19/2014

Program Code: AN

Program Name: Potato Research

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Non-Technical Summary

The eastern U.S. potato industry needs new potato varieties to overcome pest problems while reducing agricultural chemical use and to enhance marketing opportunities. This project will conduct potato breeding, germplasm enhancement, and selection studies to improve potato productivity and quality for important eastern U.S. markets. Novel and highly improved potato germplasm and varieties will be developed to reduce the impact of economically important potato pests, such as golden nematode, late blight, pink rot, and scab.

Accomplishments

Major goals of the project

1)Improve potato productivity and quality for important eastern U.S. markets by breeding and developing improved potato varieties; 2)Reduce the impact of economically important potato pests in the eastern U.S. by breeding and developing

improved potato germplasm; 3) Select widely-adapted potato varieties by screening yield, quality, and pest resistance traits at multiple eastern locations; 4) Facilitate commercial adoption of improved new varieties by coordinating initial commercial trials and by developing management recommendations; 5) Curate and refine our project website and web-based potato variety performance database used by researchers, extension, potato growers, and allied industry members.

What was accomplished under these goals?

This project breeds, selects and develops new potato varieties that will be beneficial to potato producers in the eastern U.S. Crosses between parents with desirable traits take place at ME, NY, NC, and USDA Beltsville, MD. Field sites in ME, NY, MD, PA, OH, VA, NC, and FL are used to test the breeding materials for yield and quality traits over a wide range of growing conditions. The yield and tuber quality evaluations begun under this project during 2011 were completed during 2013. The results included measurement of internal tuber defects, cooking quality, chip and french fry quality, tuber glycoalkaloid levels, tuber dormancy in storage, and resistance to fusarium dry rot. The most promising clones from 2012 were advanced for continued testing in 2013, while those which were judged to have significant weaknesses were dropped from testing. Seedstocks of the clones retained for 2013 testing were distributed to trial sites in ME, NY, PA, OH, MD, VA, NC, FL, as well as other US states and Canadian provinces. Four eastern clones (AF0338-17, AF4157-6, NY140, and NY148) were entered into the 2012 and 2013 US Potato Board chipping trials. All four have demonstrate good commercial potential. Seed multiplication of the most promising clones identified during the 2012 growing season resulted in commercial-scale trials during 2013. From the ME program, there were five advanced clones entered into commercial evaluations during 2012 and 2013. As a result of marketing tests, AF0338-17, a round-white that is widely adapted to eastern growing conditions and produces excellent chips from the field, is being commercial released as Sebec. AF3001-6, a high yielding, verticillium resistant, fry processing clones with excellent fried product color is being released as Easton. AF3362-1 continues evaluation as a dual-purpose russet, while AF4659-12 is being evaluated as a specialty, fingerling-type yellow-fleshed clones and AF4138-8 is being evaluated for round-white fresh market. To facilitate the adoption process, ME coordinated 16 commercial-scale trials representing 11 new potato varieties (2 chippers, 1 round-white, 3 russets, 3 reds, and 2 specialty market yellow fleshed) and 111 acres during 2013. Additional commercial trials were conducted in the other participating states. Potato clones in these commercial tests came from ME, ND, NY, USDA, and the Pacific Northwest. The most promising clones have been entered into disease-free tissue culture and commercial seedstocks are being multiplied and made available to seed potato growers in ME and elsewhere.

Eastern potato production represents hundreds of farms and more than \$460 million cash farm receipts; therefore, the impact of a successful new potato variety can mean many millions of dollars to the industry. Consumers also benefit from the high quality, local food production resulting from new potato variety adoption. Disease resistant varieties generated by this project have the potential to greatly reduce growers' losses to devastating diseases such as pink rot and/or late blight. Adoption of late blight resistant varieties would reduce the number of fungicide applications needed to grow a potato crop and/or reduce the risk of late blight infection and spread. Golden nematode, a serious pest found in NY and other countries, cannot be effectively managed without the resistant potato varieties generated by this and other potato breeding projects. The eastern potato breeding and selection effort produces new varieties and evaluates their potential to serve fresh, processing, and specialty markets in the East. Red Maria (NY129) was released in 2010 and two new chipping varieties, Lamoka (NY139) and Waneta (NY138) were released in 2011. Elkton (B1992-106) was released in 2012, while Sebec (AF0338-17) and Easton (AF3001-6) will be released in early 2014. These varieties and other promising clones from the project continue to be evaluated and adopted by the potato industry. Adoption and seed multiplication take considerable time in the potato industry, so impacts occur over a long time period. Recent eastern releases since 2002 (those listed above plus Beacon Chipper, Marcy, Monticello, Harley Blackwell, Red Maria, Lehigh, and Peter Wilcox) were grown on 1027 ME and NY seed acres during 2013 with a seed value of \$3.08M. The resulting seed crop had the potential to plant 9242 acres in 2014 with a ware value conservatively estimated at \$27.7M. Over a longer time frame, 26 of the ~100 varieties listed in the ME and NY certified seed directories were released by the Eastern programs since 1990. These releases represent 1883 seed acres with a seed value of \$5.7M. This seed crop had the potential to plant 17,000 acres in 2014 with a conservatively projected value of \$50.8M. This excellent rate of adoption will grow over time as the industry builds seed supplies. There is particularly strong grower interest in improved new chipping varieties to meet quality requirements of eastern processing plants. Harley Blackwell, Elkton, and Sebec (AF0338-17) fit this need in NC and other southeastern states where internal defects reduce the quality of the current standard chipping variety, Atlantic. Lamoka and Waneta are new chipping varieties that are being rapidly adopted by the industry. Easton (AF3001-6) and AF3362-1 have potential as improved fry processing varieties. Specialty varieties, Adirondack Blue, Adirondack Red, Lehigh and Peter Wilcox, are being adopted by small-scale fresh market growers because of their yellow, blue, or red flesh color and excellent culinary quality.

What opportunities for training and professional development has the project provided?

{Nothing to report}

How have the results been disseminated to communities of interest?

Research results have been made available through printed materials, presentations, and web sites. Each state works with growers and industry advisors to make sure that the research is relevant to local needs. Research trials are often conducted

on-farm and small-scale commercial demonstration trials are conducted as part of the projects potato variety development efforts. Adoption of new varieties is summarized in the accomplishment section.

What do you plan to do during the next reporting period to accomplish the goals?

{Nothing to report}

Participants

Actual FTEs for this Reporting Period

Role	Faculty and Non-Students	Students within Staffing Roles			Computed Total by Role
		Undergraduate	Graduate	Post-Doctorate	
Scientist	0.7	0.5	0	0	1.2
Professional	0.6	0	0	0	0.6
Technical	4.2	0	0	0	4.2
Administrative	0	0	0	0	0
Other	0	0	0	0	0
Computed Total	5.5	0.5	0	0	6.0

Target Audience

Potato growers, potato processors, home gardeners, and consumers of potatoes and potato products. Research results are delivered in written reports, popular press, web sites, and presentations at grower meetings. Variety development involves applied research which is conducted on University research station farms, commercial farms, and by home gardeners. Some of the new potato varieties go directly to consumers via supermarkets, farmers' markets, and roadside stands, while others are utilized by potato chip and/or french fry processors. The resulting processed products are purchased by consumers.

Products

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2013	YES

Citation

Gergela, D.M., L. Zotarelli, K. Haynes, and G.A. Porter. 2013. B1992-106, a new potential chipping potato variety for Florida. Am J Potato Research 90: 131 (abstr.)

Porter, G.A., P. Ocaya, and T.Mills 2013. New varieties from the breeding and variety development program. Proceedings of the University of Maine Cooperative Extension Potato Conference, Caribou, ME. January 24, 2013 (abstr.).

Porter, G.A. and P.C. Ocaya 2013. National fry processing trial and USPB/SFA chipping potato trial. Proceedings of the University of Maine Cooperative Extension Potato Conference, Caribou, ME. January 24, 2013 (abstr.)

Type	Status	Year Published	NIFA Support Acknowledged
Other	Published	2013	YES

Citation

Porter, G.A., P. Ocaya, B. MacFarline, and B. Plummer. 2013. Potato variety trial results in Maine, 2013 growing season. PSE Departmental Mimeo 2012-01, 42 pp.

Porter, G.A., P. Ocaya, and T. Mills. 2013. Maine potato breeding program annual report, 2013 growing season. PSE Departmental Mimeo, 20 pp.

Other Products**Product Type**

New Germplasm

Description

Several new potato varieties developed as part of this project will likely be released during 2014. Plant variety protection applications have been prepared for two new potato varieties from the University of Maine and will be submitted during 2014.

Product Type

Databases

Description

The project maintains an interactive database that is used by researchers, growers, and professionals. This database provides access to project research results.

Product Type

Educational Aids or Curricula

Description

Trade show booths at the Maine Potato Conference and the National Potato EXPO provide a hands on opportunity for growers and others to learn about next potato varieties coming from the project.

Changes/Problems

{Nothing to report}