

IMPACT STATEMENT

January 9, 2020

In recent years breeders have engaged in the revolutionary remaking of potato as a diploid inbred crop. This is only possible because haploidizing technology and selfing mutants were both discovered in NRSP6 germplasm-- *by NRSP6 staff*. And NRSP6 further supported the effort in the current project term by testing techniques and importing valuable new stocks. The ploidy manipulation technique that resulted in Yukon Gold was also developed with NRSP stocks--*by NRSP6 staff*. Wisconsin cooperators isolated and incorporated the gene providing durable resistance to late blight from a wild species that had been collected in Mexico and preserved and studied in the genebank long before its potential was recognized. Washington state collaborators incorporated potent nematode resistance. In 2017, Idaho collaborators reported incorporation of resistance to greening (responsible for 10-15% waste)-- *discovered by NRSP6 staff*. Cooperators used NRSP6 stocks to develop breeding stocks resistant to verticillium and scab, and donated those back to the genebank. NRSP6 staff helped Oregon State researchers identify germplasm with strong resistance to nematodes. We produced custom hybrids and propagules to help Industry partners breed lines with much greater levels of an anti-appetite compound aimed at reducing obesity. At least 70% of named US cultivars have our exotic germplasm in their pedigrees. For example, in Wisconsin, of the past 8 cultivar releases from the breeding program, 6 have wild species germplasm as parents obtained directly from NRSP6 (see detail below). NRSP6 staff bred cold tolerant families from which a new cultivar, Winay, was released in 2018 in Peru. Sequencing the potato genome depended on the use of genetic stocks from NRSP6 developed by cooperators at Virginia Tech. The revolutionary intragenic Innate potato lines from Simplot in Idaho were developed through the use of exotic germplasm from NRSP6. Two new potato pests—Zebra chip and *Dickeya*-- have become very serious in recent years. In the current NRSP6 project, we are cooperating with state and federal scientists in Colorado, Texas, New York, and Washington state, screening for and finding potent resistance in exotic germplasm from NRSP6. Folate deficiency causes severe birth defects. With help of NRSP6 staff, state scientists from Oregon identified wild species selections and custom hybrids available only from NRSP6 with high folate and a way to make screening for folate much easier. All these advances would not have been possible using germplasm in the common breeding pool. They needed to be accessed from exotic germplasm. And that exotic germplasm is *only* available in the USA from NRSP6. The use of NRSP6 germplasm by stakeholders has been very robust in the past, increasing knowledge and breeding products that have had a great positive impact on the crop-- and this process is increasing in the current project term. Each of the three US cultivars published this year in American Journal of Potato Research in 2018 have wild species originating at NRSP6 in their pedigrees. The cultivar Atlantic is a good example of the how the long-term job of genebanking needs perpetual support. This cultivar released in 1976 has in its pedigree *andigena* PI 205624 (imported 1953) and *chacoense* PI 175446 (imported 1949). It has been the parent of numerous additional important cultivars, and in 2018 was still in the top 10 of certified seed acres in 2018 in USA and Canada. This huge benefit to US agriculture was possible because Atlantic parents were imported and preserved for breeding use at its very start of the genebank 70 years ago.

US cultivars with NRSP6 species in their pedigrees

Excerpts from NRSP6 Annual Reports

Recent cultivar releases: Yukon Gem (2010) Classic Russet (2010), Clearwater Russet (2010), Alta Crown (2011), Cooperation-88 (2011), Alpine Russet (2011), Sentinel (2013), Huckleberry Gold (2014), Teton Russet (2014), Elkton (2014), M7 Germplasm Release (2014), AmaRosa (2012), Purple Pelisse (2012), Owyhee Russet (2012), Palisade Russet (2012), Saikai 35 (2012). They all have NRSP6 exotic germplasm in their pedigrees, including species *S. andigena*, *acaule*, *chacoense*, *demissum*, *infundibuliforme*, *phureja*, and *vernei*. Clearwater Russet released by Tri-state program as recently been accepted by McDonalds and the acreage has been increasing. NRSP6 played a significant role in development of this variety.

New cultivars and releases published this year: Germplasm releases for Early blight resistance, Sierra Rose (2015), and Peter Wilcox (2015). They all have NRSP6 exotic germplasm in their pedigrees, including species *S. andigena*, *phureja*, *stenotomum*, *palustre*, *bulbocastanum*, *stoloniferum*, *edinense*.

The cultivars published this year (2016) in *American Journal of Potato Research* are Targhee Russet, Igorata, Yukon Nugget. They all have exotic germplasm from NRSP6 in their pedigrees: *S. phureja*, *stenotomum*, *speggazzinii*, *raphanifolium*, *demissum*, *vernei*

From the 2018 Annual Report: At least 70% of named US cultivars have our exotic germplasm in their pedigrees. For example, in Wisconsin, of the past 8 cultivar releases from the breeding program, 6 have wild species germplasm as parents obtained directly from NRSP6. Each of the three US cultivars published in 2017 in *American Journal of Potato Research*, Lamoka, Sage Russet, and Payette Russet have exotics *S. chacoense*, *demissum*, and *andigena* in their pedigrees.

Reveille Russet (2018) has wild species *S. acaule* from NRSP6 in its pedigree.

Castle Russet (pending) has germplasm introgressed from *Solanum vernei*, *S. chacoense* and *S. stoloniferum*, is resistant to PVY, CRS, PMTV, coldsweetening and is one of the six clones (one of the two from U.S. the other being Atlantic) selected for PanGenome sequencing.