

## **Northeastern IPM Center – IPM Partnership Grants – 2010 – Proposal Project Description**

**PD: Rebecca Brown**

**Project Title: Evaluation of Specialty Potato Varieties for Late Blight Resistance and Adaptation to Rhode Island**

**Project Type: Minigrant**

### **Project Summary**

In 2009 late blight caused substantial crop losses for farmers growing potatoes in Rhode Island and throughout the Northeast. Most potatoes grown in Rhode Island are harvested for fresh market. Traditional eastern white potato varieties are being replaced with specialty potatoes which are popular with chefs, farmers' market customers, and CSA members. Growers serving these direct retail markets are more likely than wholesale growers to be certified organic or pesticide-free, making disease resistance a major component of their IPM strategy. There is little information available on the susceptibility of specialty potato varieties to the current populations of late blight. In addition, many of the newer late blight resistant varieties have not been tested for adaptation to the coastal climate of southern New England, and growers are not familiar with them. The objective of this project is to conduct a variety trial of specialty potatoes and late blight resistant varieties to determine their suitability for fresh market production in Rhode Island. Potatoes will be grown in replicated small plots and evaluated for disease and insect problems, yield, tuber quality and eating quality. The trial will be managed to encourage late blight; if natural infection is insufficient varieties will be tested in the lab using the detached leaf method. Trial results will be communicated to growers through the August twilight meeting, a trial report, and recommendations in the 2012 New England Vegetable Management Guide. Trial results will benefit growers by permitting them to select less-susceptible varieties for planting, and adjust their use of preventative fungicides accordingly.

### **Background and Justification**

Traditionally late blight (*Phytophthora infestans*) has not been a common problem on potatoes in southern New England. However, in 2009 early-season introduction of an aggressive, metalaxyl-resistant strain combined with prolonged cool, wet weather to cause widespread crop damage. Potato production in southern New England differs from that in major production areas in that essentially the entire crop is sold as tablestock, and much of it is marketed through direct retail (NASS 2009). The two most popular potato varieties are Norwis and Superior, both of which are very susceptible to late blight. Many producers also grow standard varieties of red potatoes, Yukon Gold, and novelty potatoes such as fingerlings, red and blue fleshed varieties, and yellow-fleshed potatoes. These producers are more likely than producers who grow for wholesale or processing to be certified organic or pesticide-free, as customers are willing to pay a premium for produce grown without pesticides. Few fungicides are available for prevention of late blight on organic potatoes, and most are of limited effectiveness (Kuepper and Sullivan 2004). Thus resistant varieties are a key component of cultural techniques to minimize disease. National and regional potato variety trials are focused on identifying clones suited to chipping or wholesale production, limiting the range of material evaluated for late blight resistance (Haynes et al. 2002). In addition the regional trials for the Northeast are located at inland sites with growing conditions substantially different from coastal New England; new varieties which appear promising in those trials may not be suited here. At the same time, many novelty potatoes

and heirlooms popular with home gardeners and market growers have never been evaluated for late blight tolerance. In 2009 we grew 20 varieties of novelty potatoes at the University of Rhode Island Agronomy farm under severe foliar late blight pressure. None of the varieties were known to be especially tolerant of late blight. The variety Inca Gold showed resistance; lesions remained small and did not sporulate. The variety Yellow Finn was highly tolerant (Brown, unpublished). Growers in southern New England and novelty potato growers throughout the region would benefit from trials designed to evaluate both late blight resistance and adaptation of heirloom varieties, new varieties bred for late blight resistance, and resistant breeding lines which may be acceptable as novelty potatoes even though they have poor chipping quality or are unsuited to wholesale production.

### **Objectives and Anticipated Impacts**

The objectives of the proposed study are as follows:

1. Evaluate heirloom and novelty varieties, new late blight tolerant releases and experimental lines from NE1014 breeding programs, and selected PI accessions for adaptation to Rhode Island growing conditions and potential attractiveness to purchasers of locally grown produce
2. Screen heirloom and novelty varieties for late blight tolerance

Anticipated impacts of this project are as follows:

1. Potato producers in Rhode Island and southern New England will adopt late blight resistant or tolerant varieties which are not currently grown in the region
2. Information will become available on the relative late blight susceptibility of heirloom and novelty varieties popular for direct retail so growers can select varieties suited to their late blight risk and willingness to use fungicides

### **Approach and Procedures**

The potato variety trial will be conducted at the University of Rhode Island Agronomy Farm in Kingston, RI. The Bridgehampton loam soil at the farm is well suited to potato production and typical of lands used for potatoes in Rhode Island. The literature will be searched for varieties and PI accessions reported to be resistant to late blight, and seed acquired for as many as possible. NE1014 potato breeders will be invited to submit new releases and experimental lines for trialing. Heirloom and novelty varieties will be purchased from potato seed companies which serve home gardeners and market growers.

Adaptation, yield, and quality will be evaluated in 10 ft. plots using a randomized block design with three replications. Cultural practices will follow extension recommendations (NEES 2009); fungicide and insecticide will be applied only if needed to prevent severe damage. Data will be collected on stand establishment, disease and insect damage, and days to flowering. At harvest potatoes will be graded by marketability and weighed to determine yield. Roasted tubers of promising varieties will be served to growers at the late summer twilight meeting, to undergraduate students in the vegetable production class, and possibly to customers at local farmers' markets to determine consumer acceptance and stimulate interest.

Late blight tolerance will be evaluated in a separate trial, which will be planted on the site of the infected 2009 trial. Spreader rows of a susceptible check and overhead sprinkler irrigation will be used to encourage natural late blight infection. Foliar tolerance will be rated using visual estimation of percent foliage affected on a weekly basis. Tuber tolerance will be evaluated using digital image analysis of cut tubers (Douches et al. 2002). If weather conditions are not conducive for late blight infection in the field trial entries will be screened in the lab using the detached leaf assay (Goth and Keane 1997) and cultured fungus isolated from field-infected plants in 2009.

Trial results will be communicated to growers and seed suppliers through a trial report published on the URI Sustainable Agriculture website. Information on late blight tolerance of adapted varieties will be submitted for inclusion in the 2012 New England Vegetable Management Guide. Results will also be communicated at twilight meetings and possibly at the New England Vegetable and Fruit Conference in 2011.

### **Evaluation Plans**

Impacts of the proposed research will be evaluated in several ways. The web page with the trial results will include a counter to track the number of visits to the site. Potato growers in Rhode Island will be contacted in 2012 or 2013 to determine how many of them have trialed recommended varieties on their farms, and what their opinion of the varieties is.

### **Key Personnel**

The project director, Dr. Rebecca Brown, is an assistant professor in the Department of Plant Science and Entomology. Her research areas include evaluation of varieties and production methods for vegetables, reduced-input turfgrasses, and native grasses. She has a PhD in vegetable breeding from the Department of Horticulture at Oregon State University and extensive experience conducting variety trials and screening for disease resistance.

Kristen Castrataro is the extension educator for food and fiber agriculture for the state of Rhode Island. She partners with Dr. Brown in communicating research results to vegetable producers and other stakeholders.

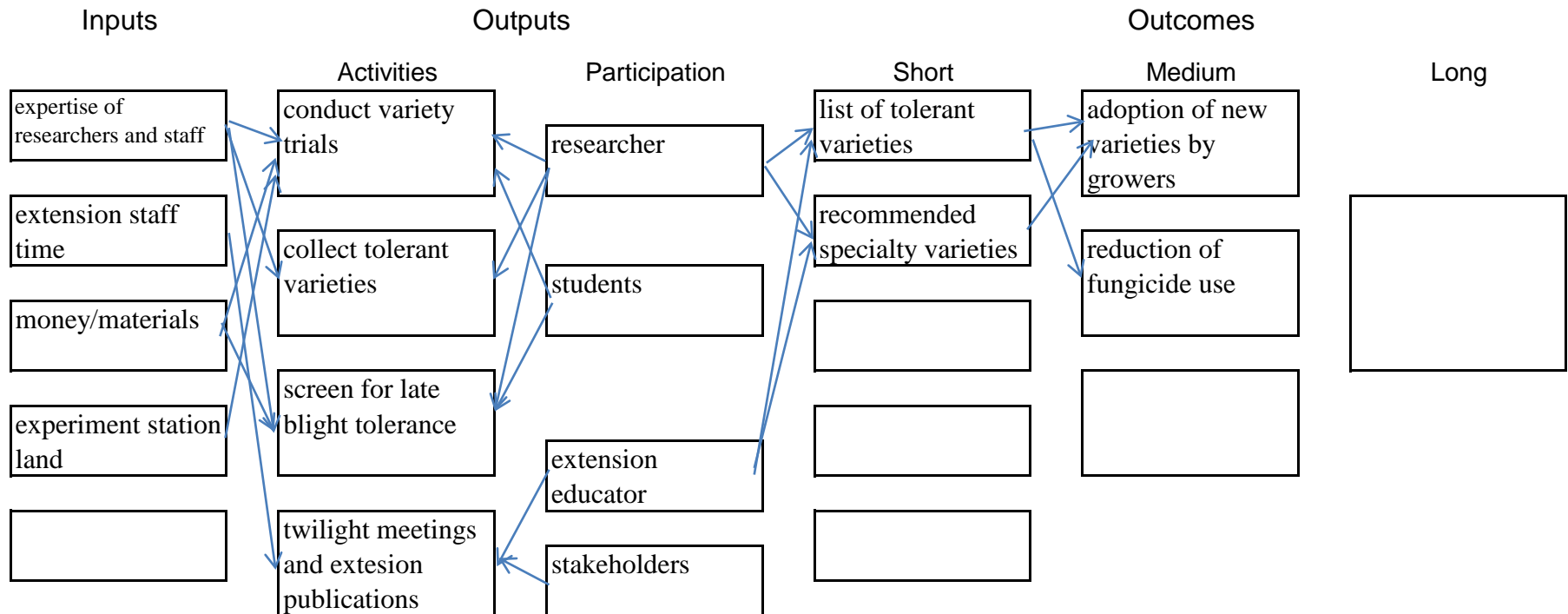
### **References**

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**SITUATION:** Late blight has become a significant concern for farmers in RI and the Northeast who are growing specialty (novelty) potatoes for local retail. Many of these farmers are organic or pesticide-free, making resistant varieties an important tool.

**PRIORITIES:** local and regional information to meet stakeholder needs

### PROGRAM ACTION- LOGIC MODEL



**Assumptions:**

- 1 tolerant varieties exist and are adapted
- 2 late blight will continue to be a concern for growers
- 3 potato breeders will provide material for trialing

**External Factors:**

- 1 weather
- 2 funding
- 3

# 2009 Potato Variety Trial

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The potato variety trial included 26 varieties, mostly specialty types not commonly found in local supermarkets. Certified seed potatoes were purchased from Ronniger Potato Farm in Austin, Colorado ([www.ronnigers.com](http://www.ronnigers.com)), Wood Prairie Farm in Bridgewater, Maine ([www.woodprairie.com](http://www.woodprairie.com)) and Gillette's Agway in Exeter, RI. As with the tomatoes, the dominant theme of this year's trial was late blight, which appeared in the Island Sunshine and Irish Cobbler plots in early July. The trial was sprayed with chlorothalonil, but we were unable to eradicate the fungus. One variety, Inca Gold, showed excellent late blight resistance. Several other varieties showed good tolerance, maintaining live foliage until mid-August despite high disease pressure. Some differences in susceptibility to Colorado Potato Beetle and Japanese Beetle feeding were observed, but beetle pressure never became extreme. See Table 1 on the reverse side for details on each variety.

Table 1. Potato variety trial entries, with information on response to late blight and beetles. CPB = Colorado potato beetle. JB = Japanese beetle.

Variety	Source	Type	Maturity	Skin Color	Flesh Color	Late Blight	Beetles	Notes
<b>Dark Red Norland</b>	Agway	red	early	red	white	susceptible	some CPB, lots of JB	
<b>Russet Burbank</b>	Agway	idaho	late	brown	white	mod. tolerant	lots of CPB	
<b>Yukon Gold</b>	Agway	yellow	early	yellow	yellow	susceptible	some CPB	
<b>Superior</b>	Agway	eastern	early	yellow	white	mod. tolerant	few	
<b>Green Mountain</b>	Agway	eastern	late	yellow	white	tolerant	none	rough tubers, lots of rot
<b>Katahdin</b>	Agway	eastern	late	yellow	white	mod. tolerant	damage only	
<b>King Harry</b>	Wood Prairie	eastern	mid	yellow	white	mod. susceptible	JB only	advertised as CPB resistant. Large, uniform tubers
<b>Prairie Blush</b>	Wood Prairie	yellow	mid	yellow w/ red	yellow	susceptible	JB only	
<b>Caribe</b>	Wood Prairie	red	early	purple	white	susceptible	damage only	
<b>Island Sunshine</b>	Wood Prairie	yellow	late	yellow	yellow	very susceptible	some	advertised as resistant to tuber late blight
<b>Sangre</b>	Ronniger	red	mid	red	white	mod. susceptible	lots of CPB	needs deep hilling, knobby tubers
<b>Bintje</b>	Ronniger	yellow	late	yellow	yellow	mod. susceptible	some CPB	
<b>Kipfel</b>	Ronniger	fingerling	mid	yellow	yellow	susceptible	lots of CPB	weak stems
<b>Purple Majesty</b>	Ronniger	colored	early	purple	purple	susceptible	none	lots of leaf damage but no stem lesions, some tuber rot
<b>German Butterball</b>	Ronniger	yellow	late	yellow	cream	tolerant	few	
<b>Peanut</b>	Ronniger	fingerling	early	yellow	yellow	mod. susceptible	none	brittle stems
<b>French Fingerling</b>	Ronniger	fingerling	mid	red	yellow	tolerant	eggs only	
<b>Irish Cobbler</b>	Ronniger	eastern	early	brown	white	very susceptible	JB only	shallow tubers, lots of rot
<b>Inca Gold</b>	Ronniger	yellow	late	yellow w/ purple	yellow	resistant	few	very pretty plants
<b>Mountain Rose</b>	Ronniger	colored	early	red	pink	moderate	lots of CPB	
<b>Rose Gold</b>	Ronniger	yellow	mid	pink	yellow	mod. susceptible	some CPB	
<b>Romanze</b>	Ronniger	yellow	late	red	yellow	mod. tolerant	some CPB	
<b>Yellow Finn</b>	Ronniger	yellow	mid	yellow	yellow	very tolerant	none	
<b>Rose Finn Apple</b>	Ronniger	fingerling	mid	pink	yellow	tolerant	lots of CPB	tubers very branched/knobby
<b>Morris Piper</b>	Ronniger	eastern	mid	yellow	cream	mod. tolerant	few	
<b>Huckleberry</b>	Ronniger	colored	mid	red	pink	tolerant	JB only	lots of tuber cracking, some rot