2020

Klamath Basin Potato Variety Development Summary

Oregon State University
Klamath Basin Research and Extension Center

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Introduction

Since its inception in 1985, the Tri-State variety development program has primarily focused on the development of processing and dual-purpose (process and fresh) russets. Recent breeding efforts have focused more on improving genetic resistance to various pests and diseases as a means of lowering production costs. During the past decade, Oregon has been the lead state in the release of eleven russet varieties. Although the development of russet varieties remains the primary focus, recent efforts have included red-skinned and specialty-type selections. Many of these selections offer unique skin and/or flesh color combinations along with enhanced nutritional qualities including elevated antioxidant and Vitamin C content. In total, more than 25 new varieties have been released by the Tri-State variety development program since 1985. More recently Klamath Basin growers have identified the need for chipping potatoes suitable for export markets. Trials were initiated in 2008 and 2009, with funding from the Oregon Potato Commission, to identify acceptable chipping varieties using advanced selections and recently released varieties from the Tri-State, Southwest, North-central, and Eastern breeding programs.

Screening for resistance to various species of nematodes and related diseases is being accomplished at several locations. The Klamath Basin Research and Extension Center (KBREC) routinely screens selections for resistance to root-knot nematode (*Meloidogyne chitwoodi* and *Meloidogyne hapla*) and corky ringspot disease (CRS) resulting from infection of Tobacco rattle virus which is vectored by stubby-root (*Paratrichodorus* spp.) nematodes. Other cooperating sites within the Tri-State area also work on resistant screening and other production limitations most suited to their respective location. The overall objective is that future releases will offer genetic resistance to many economically important pests and diseases which will help reduce production inputs as these costs continue to rise.

The Klamath Basin Research and Extension Center (KBREC) also serves as an initial field screening location for first-generation selections of russet, specialty, and chipping clones (single-hills). Second-year evaluations of four-hill red/specialty and chip selections also take place in Klamath; however, russet selections are currently sent to the Central Oregon Agricultural Research Center (COARC). Breeding progeny are supplied by programs at the USDA Agricultural Research Service (ARS) facility in Prosser, Washington, and Aberdeen, Idaho, as well as, Oregon State University (OSU), Colorado State University, and North Dakota State University.

The purpose of this summary booklet is to report the results of our variety trial efforts. In 2009, KBREC participated in the following research trials: Russet Preliminary Yield 2 (PYT-2), Statewide Russet, Tri-state Russet, Western Regional Russet, Red/Specialty PYT- 1, Statewide Specialty, Tri-state Specialty, Western Regional Red/Specialty, and a modified Western Regional Chip Trial. A brief summary of weather during the growing season, insect trapping results, and single-hill selections.

Acknowledgements

The ultimate goal of variety development at OSU-KBREC and cooperating Tri-state partners is the development and commercialization of new potato varieties to benefit the Northwest potato industry. The effect of the Tri-state Potato Variety Development Program on the Northwest potato industry has been substantial. The fresh market industry, French fry processors and chippers have incorporated many varieties developed through this program into their businesses. Ranger Russet, Western Russet, Umatilla Russet, and Alturas are examples of russet cultivars released from the Tri-State program that have greatly benefited the Northwest potato industry, being the 3rd, 5th, 7th, and 8th most widely grown cultivars in Oregon and accounted for 27% of total acreage. As expected, recently released russet varieties have found greater adoption by Northwest processors compared to fresh market usage in the Klamath Basin. However, several varieties have found fresh market niches in the Klamath Basin including GemStar Russet, Premier Russet, and most recently Classic Russet.

Varieties recently released by the Tri-State program are now produced on over 140,000 acres in the Pacific Northwest with value to growers estimated at approximately $390 million. A recent economic analysis of the Tri-state breeding effort revealed that every dollar invested in the program results in a $39 return (Araji and Love, 2002). The current focus of Tri-state variety development efforts is to develop improved varieties that increase quality and production efficiency while decreasing fertilizer and pesticide inputs.

The success of OSU-KBREC potato variety development is made possible with funding from USDA CREES, USDA ARS, and the generous support of the Oregon Potato Commission. In addition, the Klamath Potato Growers Association annually contributes to OSU-KBREC research and Extension activities.

References

Araji, A.A. and S. Love. 2002. The economic impact of investment in the Pacific Northwest potato variety development program. **Amer. J. Potato Res.** 79:411-420.

Special Acknowledgment

OSU-KBREC plagiarized the design and layout for this publication from the WSU Potato Cultivar Yield and Postharvest Quality Evaluation publication. This is an excellent publication which provides a vast amount of data in a 'grower friendly' venue. The publication below, by the Washington State University Potato Research Group, can be found at the listed website.

Mark Pavek, Rick Knowles, Zach Holden, Nora Fuller. 2009. Washington State University Potato Research Group, Pullman, WA. **2009 Potato Cultivar Yield and Postharvest Quality Evaluations.** http://www.potatoes.wsu.edu

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Commissions and Associations

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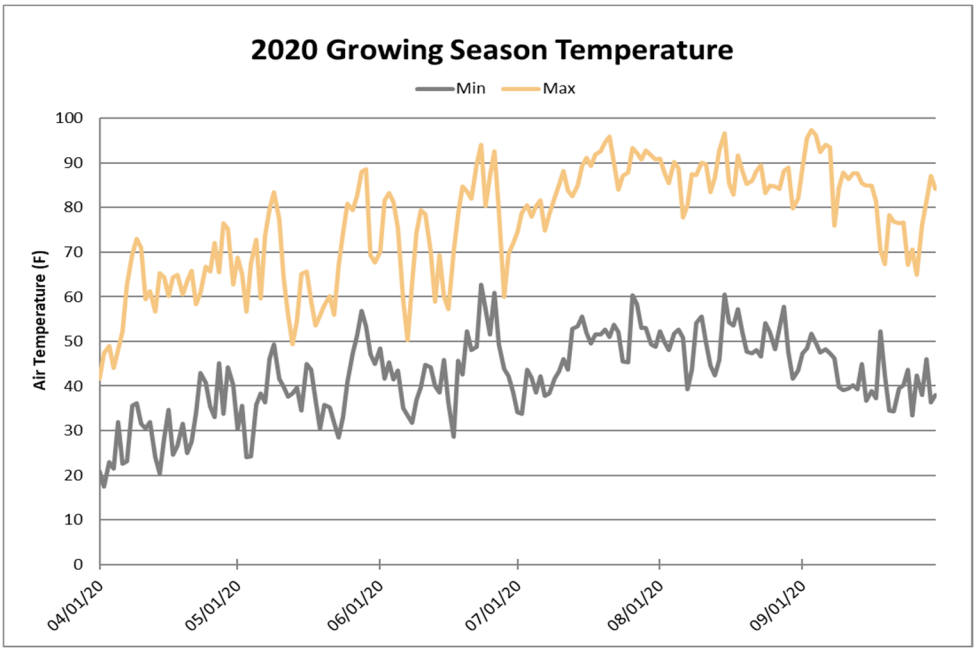
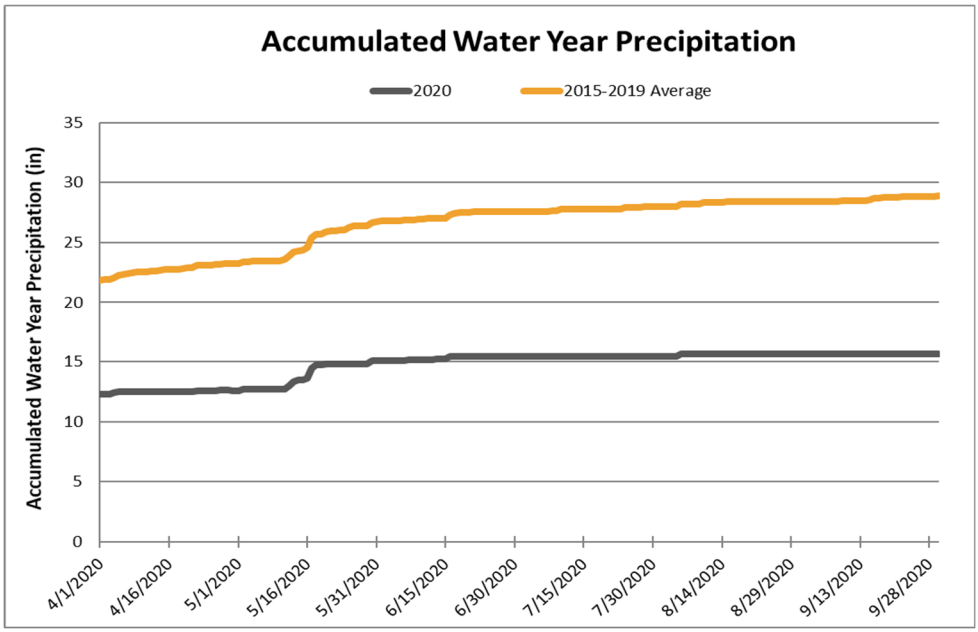
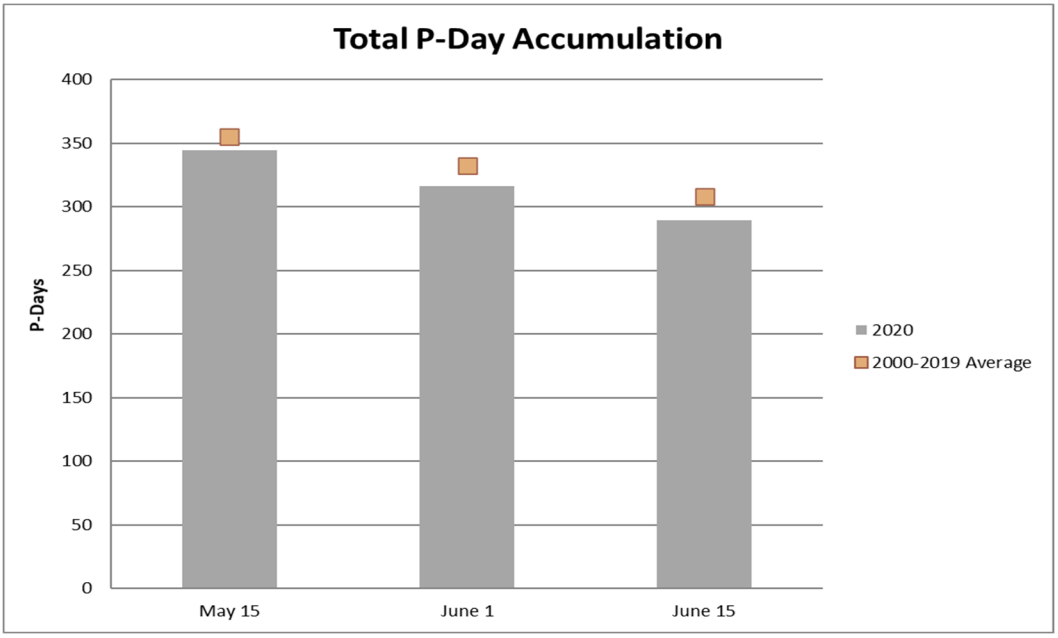
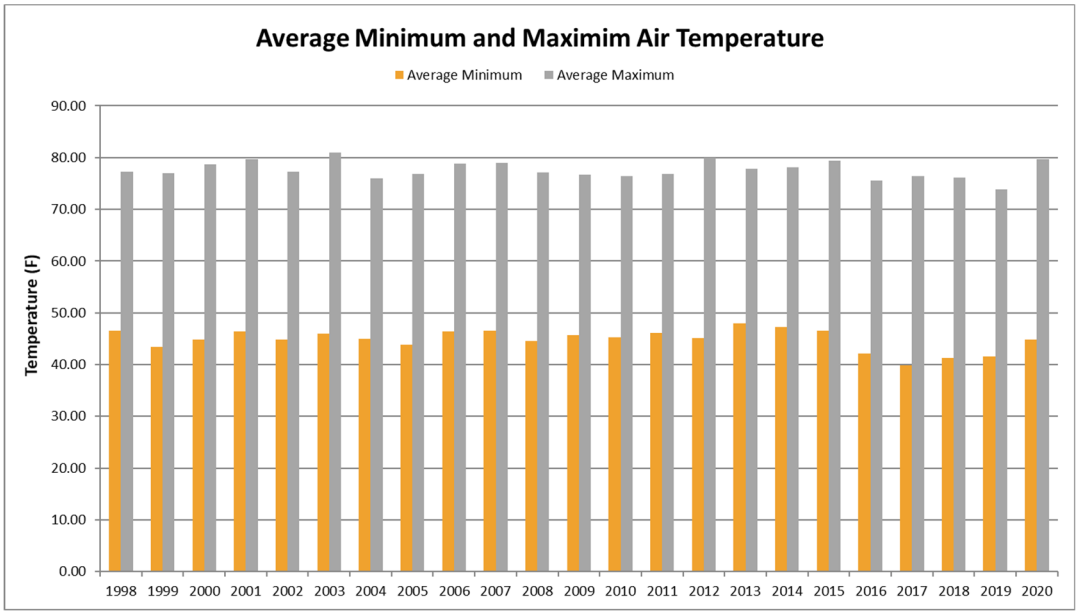
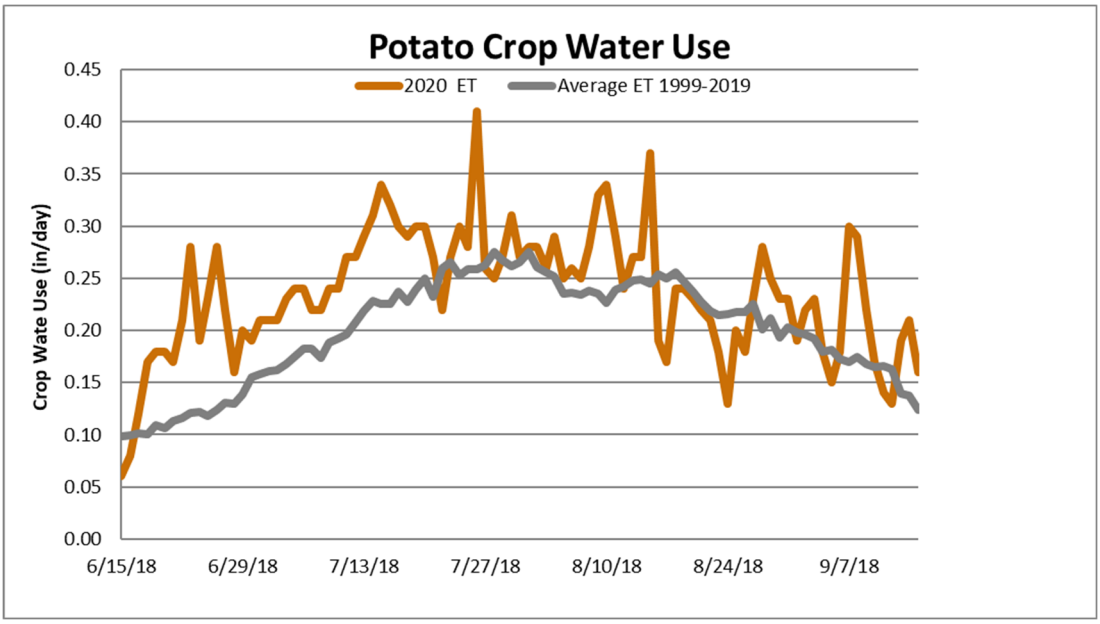
Weather Data





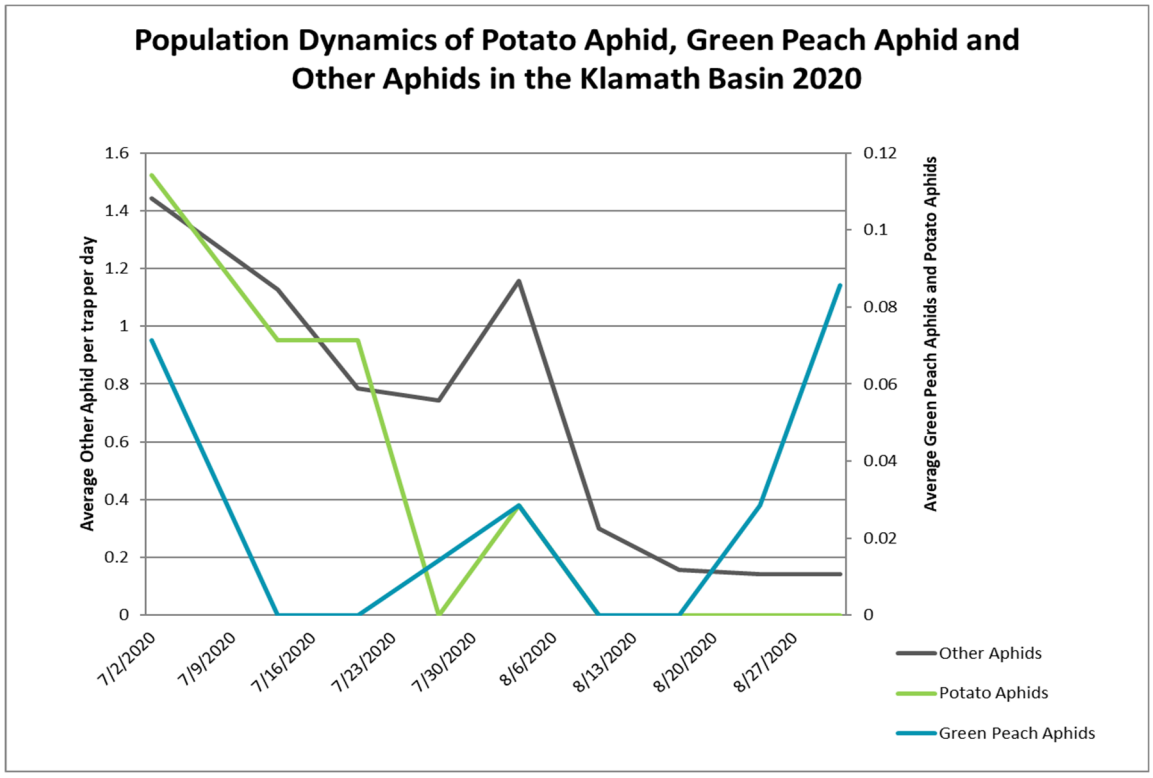

Total P-Day Accumulation
P-Days
400
350
300
250
200
150
100
50
0
May 15
June 1
June 15
2020
2000-2019 Average

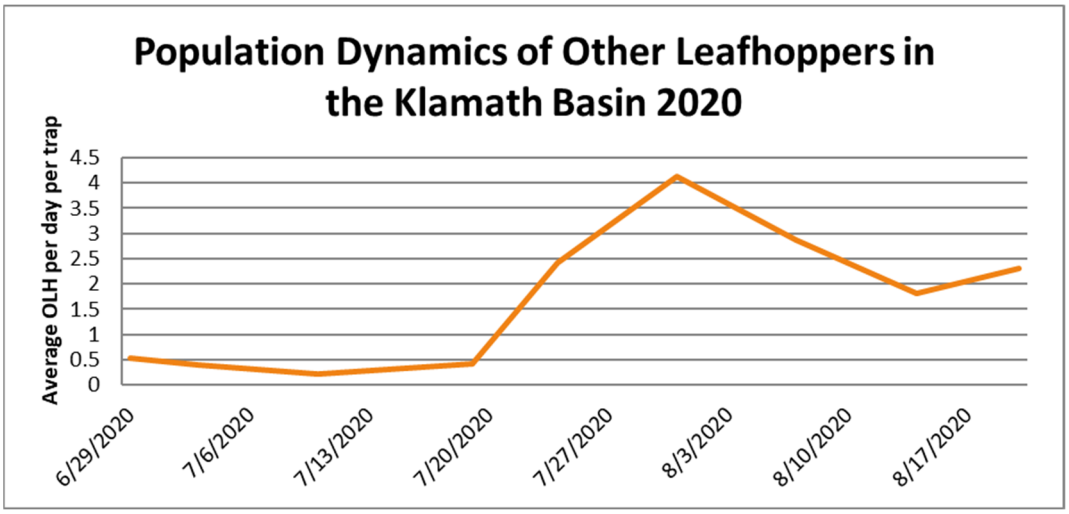

Average Minimum and Maximim Air Temperature
Average Minimum
Average Maximum
Temperature (F)
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

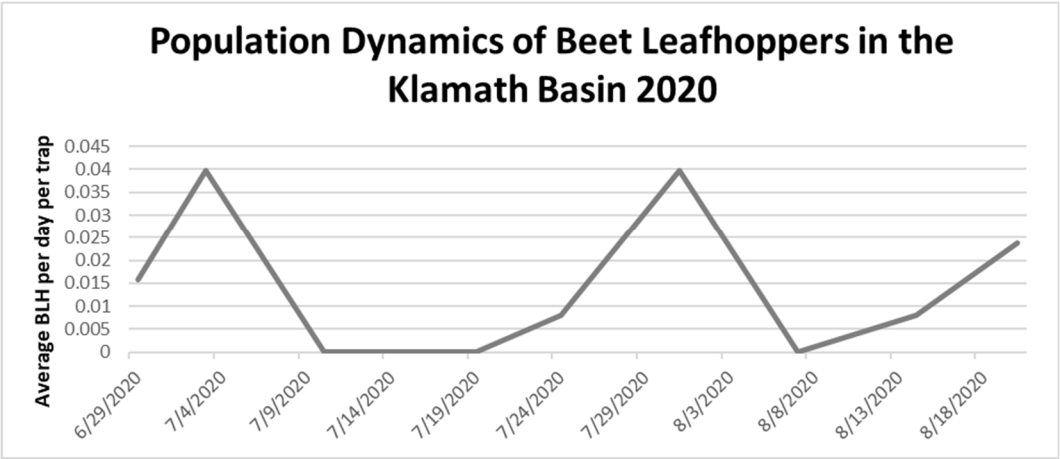

Potato Crop Water Use
2020 ET
Average ET 1999-2019
Crop Wate Use (in/day)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
6/15/18
6/29/18
7/13/18
7/27/18
8/10/18
8/24/18
9/7/18

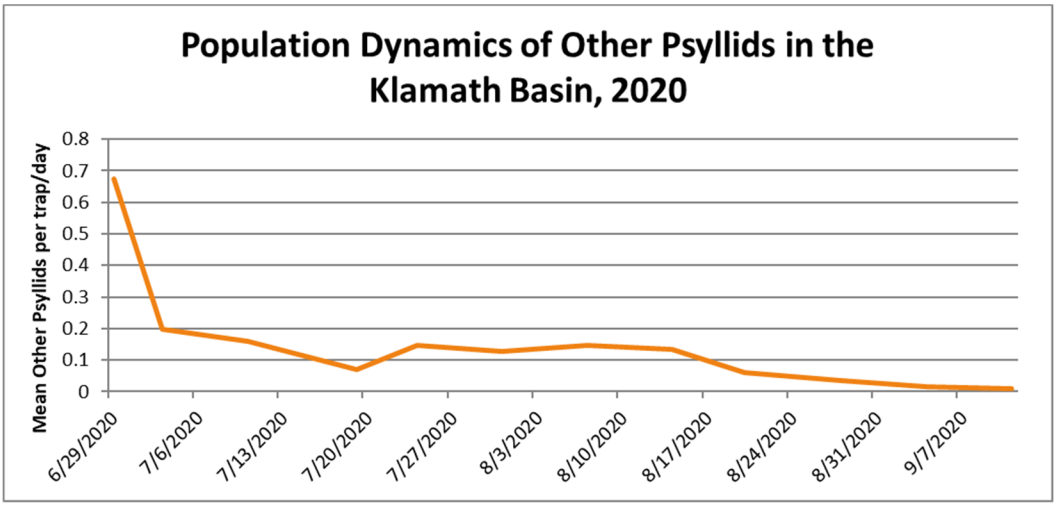
2020 Insect Trapping Results

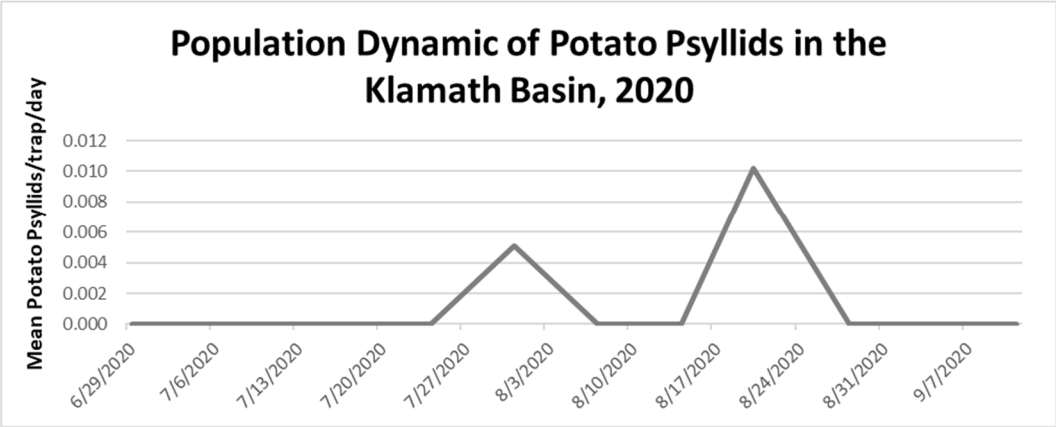
Potato tuberworm was first detected in the Klamath Basin in late August of 2005. KBREC initiated an extensive trapping program the following year (2006) and have continued this effort annually. In 2009, we expanded our trapping efforts to include aphids, leafhoppers, and psyllids. Eighteen Delta traps (tuber moth), ten yellow water-pan traps (aphids), and eighteen sticky cards (leafhoppers and psyllids) were placed in growers' fields shortly after crop emergence. Traps were checked weekly during the growing season and results were tabulated and made available to growers, crop consultants, and other industry personnel electronically in a newsletter titled *Potato Bytes.* This newsletter was also published on the KBREC website at http://oregonstate.edu/dept/kbrec/. Collected data provided Basin producers with pertinent information to improve pest management strategies. The following graphs show population dynamic trends for aphids and leafhoppers throughout the growing season.




Population Dynamics of Other Leafhoppers in the Klamath Basin 2020
Average OLH per day per trap
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
6/29/2020
7/6/2020
7/13/2020
7/20/2020
7/27/2020
8/3/2020
8/10/2020
8/17/2020


Population Dynamics of Beet Leafhoppers in the Klamath Basin 2020
Average BLH per day per trap
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
6/29/2020
7/4/2020
7/9/2020
7/14/2020
7/19/2020
7/24/2020
7/29/2020
8/3/2020
8/8/2020
8/13/2020
8/18/2020


Population Dynamics of Other Psyllids in the Klamath Basin, 2020
Mean Other Psyllids per trap/day
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
6/29/2020
7/6/2020
7/13/2020
7/20/2020
7/27/2020
8/3/2020
8/10/2020
8/17/2020
8/24/2020
8/31/2020
9/7/2020


Population Dynamic of Potato Psyllids in the Klamath Basin, 2020
Mean Potato Psyllids/trap/day
0.012
0.010
0.008
0.006
0.004
0.002
0.000
6/29/2020
7/6/2020
7/13/2020
7/20/2020
7/27/2020
8/3/2020
8/10/2020
8/17/2020
8/24/2020
8/31/2020
9/7/2020

Guide to Clone Designation

Example: AC99375-1RU

AC99375-1RU	Breeding Program (**A**berdeen, ID)
A**C**99375-1RU	Selection Site (**C**olorado)
AC**99**375-1RU	Year of Cross (19**99**)
AC99**375**-1RU	Cross Number (**375**)
AC99375-**1**RU	Tuber Selection (**1**)
AC99375-1**RU**	Russet (**Ru**)

Location Codes

Designation	Breeding Program	Selection Program	Other
A	**A**berdeen, Idaho	**A**berdeen, Idaho	
AO	**A**berdeen, Idaho	**O**regon	
AOA	**A**berdeen, Idaho	**O**regon	
AOR	**A**berdeen, Idaho	**O**regon	
ATX	**A**berdeen, Idaho	**Tex**as	
BTX	**B**eltsville, Maryland	**T**exas	
CO	**C**olorado		
MWTX	**M**adison, **W**isconsin	**Tex**as	
NDA	**N**orth **D**akota	**A**berdeen, Idaho	
NY	**N**ew **Y**ork		
PA	**P**rosser, Washington	**A**berdeen, Idaho	
POR	**P**rosser, Washington	**Or**egon	
TC	**T**exas	**C**olorado	
TE	**Te**tonia, Idaho		
TXA	**T**exas	**A**berdeen, Idaho	
TXNS	**Tex**as		**N**orkotah **S**train

Miscellaneous Designations

B	Chuck **B**rown's Cross
LS	**L**ow **S**ugar
P/P	**P**urple skin/**P**urple flesh
R	**R**ed skin
R/R	**R**ed skin/**R**ed flesh
R/Y	**R**ed skin/**Y**ellow flesh
Ru	**Ru**sset
W/Y	**W**hite skin/**Y**ellow flesh
LB	**L**ate **B**light resistance
PW/Y	**P**urple skin with **W**hite eyes/ **Y**ellow flesh
P/Y	**P**urple skin/**Y**ellow flesh
P/PW	**P**urple skin/**P**urple and **W**hite flesh

Single Hill Results

Approximately, sixty-six thousand (65,000) greenhouse-produced seedling tubers were planted at a Rock Creek Ranch five miles west of Running Y Ranch on June 1, 2020. Located about 20 miles west of Klamath Falls, soils are approximately 6.1 percent organic matter and a pH of 6.3. The location provides good isolation from other potato production areas and intensively fumigated soils allow us to harvest very clean material for seed increase. Progeny included 97 families from Oregon State University; 69 from USDA, Prosser, WA; 190 from USDA, Aberdeen, Idaho; 36 from Colorado State University. Several crosses included russet parents with virus, late blight and potato tuber worm resistance.

Tuber families were lifted with a two-row, level-bed digger on October 10th. A selection team including researchers, extension agents, growers and industry personnel selected desirable clones from various families immediately after lifting. As expected, selection was based primarily on external appearance; however, internal evaluation was performed on a limited number of selections. All retained material was transported to Klamath Falls, Oregon for storage at the Klamath Basin Research and Extension Center (KBREC). The following table outlines the number of single- hills provided by each breeding program and selection rate.

Location	General Cross Types	Number of Progeny Planted	Number of Progeny Selected	% Selection Rate
ARS Prosser, WA	Disease resistance, pigmented	10,295	114	1.1
Oregon State University	Disease resistance, mixed type	15,793	260	1.6
ARS Aberdeen, ID	Disease resistance, russet	34,198	444	1.3
Colorado State University		4,911	42	.85
Total		**65,197**	**860**	**1.3**

Preliminary Yield (PYT-1) Russet Screening

Eight hundred twenty four (824) selections from 2019 single-hills were planted in 16-hill seed increase plots at Rock Creek Ranch. Potato tubers were lifted using a two-row, level-bed digger on October 7, 2020. A team of about 20 research and industry personnel selected 139 clones for further evaluation based on market potential and possible disease resistance. Tubers from these selections were retained and stored at KBREC for seed increase. This material will be evaluated in a Preliminary Yield Trial (PYT-2 Russet) conducted at KBREC and other locations throughout the Pacific Northwest in 2021.

Preliminary Yield (PYT-1) Specialty Screening

Eighty six (86) selections from 2019 single-hills were planted in 16-hill seed increase plots at Rock Creek Ranch. Potato tubers were lifted using a two-row, level-bed digger on October 7, 2020. A team of about 20 research and industry personnel selected 11 clones for further evaluation based on market potential and possible disease resistance. Tubers from these selections were retained and stored at KBREC for seed increase. This material will be evaluated in a Preliminary Yield Trial (PYT-2 Specialty) conducted at KBREC and other locations throughout the Pacific Northwest in 2021.

Preliminary Yield (PYT-1) Chip Screening

One hundred seventy three (173) chip selections from 2019 single-hills were planted in 16-hill seed increase plots at Rock Creek Ranch. Potato tubers were lifted using a two-row, level-bed digger on October 7, 2020. Research and industry personnel selected 30 clones for further evaluation based on chipping potential and possible cold sweetening resistance. Seed of these selections was hand collected and stored at the KBREC potato facilities. This material will be evaluated in a Preliminary Yield Trial (PYT-2 Chip) conducted at KBREC and other locations throughout the Pacific Northwest in 2021. KBREC will also be increasing seed for future evaluation.

2020 Preliminary Yield (PYT-2) Russet Trial

Location: OSU KBREC – Klamath Falls, OR

Planting Date: June 1
Harvest Date: October 7
Fertility: 146-0-182-233 Sulfur

Vine Kill Date: September 2
Days to Vine kill: 93
In-Row Spacing: 9.25 inch

The PYT-2 Russet Trial evaluates recently selected clones, often only three years removed from single-hill selection. Retained entries are further evaluated in replicated trials at several Oregon locations before advancing (if applicable) to the Tri-state trial which includes testing locations in Washington and Idaho. This trial included 3 standard varieties and 92 new entries. The Oregon Potato Variety Development Team chose to advance 29 selections to the Statewide Russet Trial in 2020 and discarded the remaining selections due to poor performance. **Only retained selections are listed.**

Clone	Female Parent	Male Parent
AOR15122-2	Dakota Trailblazer	A05084-11
AOR15122-3	Dakota Trailblazer	A05084-11
AOR15125-2	Dakota Trailblazer	A10040-3TE
AOR15125-3	Dakota Trailblazer	A10040-3TE
AOR15194-1	A071012-4BF	A001114-4
AOR15194-2	A071012-4BF	A001114-4
AOR15218-6	A09086-1LB	AF4296-3
AOR15227-2	AF4296-3	Dakota Trailblazer
AOR15288-1	Dakota Trailblazer	A09117-3LB
AOR15291-1	Dakota Trailblazer	AF4320-7
AOR16002-1	A11104-3T	A98345-1
OR11222-1	AO03123-2	Silverton
OR11222-4	AO03123-2	Silverton
OR11202-1	AOR86576-1	Silverton
OR11181-5	PA99N82-4	Silverton
OR11182-1	PA99N82-4	Sage Russet
POR18NCK5-4	PA99N82-4	Summit
POR18NCK5-5	PA99N82-4	Summit
AOR15144-2	A03141-6	AW07791-2
AOR15152-2	A06565-11LB	AF4296-3
AOR15152-4	A06565-11LB	AF4296-3
AOR15219-2	A10114-3	A06914-3CR
AOR15292-3	Dakota Trailblazer	CW08071-2
AOR16032-1	A03141-6	OR05039-4
AOR16039-4	A10063-1	AO01114-4
AOR16050-1	A10114-3	Alpine Russet
AOR16072-9	AO06191-1	Dakota Trailblazer
AOR16078-3	AW07791-2rus	CW08071-2
AOR15100-1	Castle Russet	A09022-4

2020 Preliminary Yield (PYT-2) Chip Trial

Location: OSU KBREC – Klamath Falls, OR
Planting Date: June 1
Harvest Date: October 7
Fertility: 146-0-182-233 Sulfur
Vine Kill Date: September 2
Days to Vine kill: 92
In-Row Spacing: 9.25 inch

The PYT-2 Chip Trial evaluates recently selected clones, often only two years removed from single-hill selection. Retained entries are further evaluated in replicated trials at several Oregon locations before advancing (if applicable) to the Tri-State trial which includes testing locations in Washington and Idaho. 10 selections were evaluated with 4 retained for further evaluation.

Clone	Female Parent	Male Parent
AOR10922-1	Eden	NY139
COOR16014-3	AC00206-2W	CO10073-7W
NDOR14307CB-5	ND091831C-8	ND102857CB-1
AOR15303-3	A00188-3C	Lamoka

2020 Preliminary Yield (PYT-2) Specialty Trial

Location: OSU KBREC – Klamath Falls, OR
Planting Date: June 1
Harvest Date: October 7
Fertility: 146-0-182-233 Sulfur

Vine Kill Date: September 2
Days to Vine kill: 92
In-Row Spacing: 9.25 inch

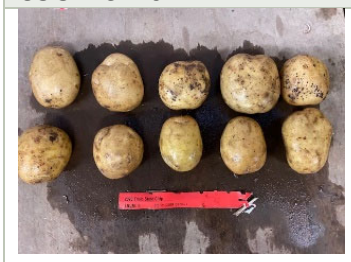
The PYT-2 Specialty Trial evaluates recently selected clones, often only two years removed from single-hill selection. Retained entries are further evaluated in replicated trials at several Oregon locations before advancing (if applicable) to the Tri-State trial which includes testing locations in Washington and Idaho. This trial included 3 standard varieties and 13 entries. The Oregon Potato Variety Development Team chose to advance 8 selections to the Statewide Specialty Trial in 2021 and discarded the remaining selections due to poor performance. **Only retained selections are listed in the following tables.**

Entry	Female Parent	Male Parent
POR17PG64-2	POR02PG5-1	POR01PG22-1
COOR15206-1	ND8555-8R	CO05228-4R
COOR15235-1	NDTX5438-11R	CO05228-4R
COOR15235-3	NDTX5438-11R	CO05228-4R

2020 Statewide russet entries that were retained

2020 Statewide Russet	2020 Statewide Russet
AOR15421-4	AOR13020-2
	
AOR10071-8	AOR10093-11
	
AOR10129-1	AOR11027-4
	
AOR15124-1	AOR15166-2
	
AOR12069-3	AOR10063-2
	

2020 Statewide chip entries that were retained

2020 Statewide Chip	2020 Statewide Chip
NYOR14Q9-5	NYOR14Q9-9
	
COOR13270-2	NYORN41-5
	
ER.2.1435	NDOR13320CAB-2
	
AOR13124-6	
	

2020 Statewide specialty entries that were retained

2020 Statewide Specialty	2020 Statewide Specialty
POR16PG25-2	POR16PG34-1
	
OR11157-1	OR11157-10
	
POR17PG64-2	COOR15235-3
	

Klamath Basin Research and Extension Center
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