December 2021

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Research Progress Reports

for the



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Research Report to the Oregon Raspberry and Blackberry Commission and the Agricultural Research Foundation 2021-2022

TITLE: Caneberry Pesticide Registration, Tracking, and New Chemistries

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OBJECTIVES:

1. Track status of current caneberry registrations and provide information in support of the Oregon caneberry industry.

2. Update & maintain the Pesticide Registration chart and MRL chart.

3. Provide data or information to pesticide regulatory agencies that are necessary to ensure the pest management needs of Oregon's caneberry growers are being met.

PROGRESS:

Objective 1: One new labeled material became available to the caneberry industry in 2021, while others continue to move through the EPA pipeline. Table 1 details changes and pesticide registration activity that may be of interest to the caneberry industry.

Objective 2: The pesticide MRL charts were updated January 2021, and again in May 2021 and December 2021. The registration chart was updated in January 2021. The most recent charts, which have been distributed to industry stakeholders are available at the end of this report.

Objective 3: All EPA pesticide re-registration activity was tracked through 2021. No pesticide information requests impacting caneberry were made in 2021.

Other Pesticide Registration Research Center activities which impact the Oregon Caneberry Industry:

 I serve as the Network Coordinator for the Pacific Northwest, a signature program through the Western Region IPM Center. The Network Coordinator follows the EPA Pesticide Re-registration Review process, solicits feedback from OSU/WSU specialists and industry contacts about the impacts of proposed label changes, and submits informed comments to EPA to aid their decision making process. Table 1. Pesticide registration activity in 2021 that is relevant to the caneberry industry.

Active ingredient	Trade name	Type of material / use	Status
Difenoconazole	Component of	Fungicide	EPA PRIA date was
	premixes		should to be set any day
Flonicamid	Beleaf	Insecticide	Report ready to be submitted to EPA
Pydiflumetofen	Miravis	Fungicide	Submitted to EPA in April 2021; EPA PRIA date set for September 2022
Pyraziflumid	Parade	Fungicide	EPA PRIA date was December 2021; tolerance should to be set any day
Saflufenacil	Treevix	Herbicide	Tolerance set by EPA in September 2020
*Sethoxydim	Poast	Herbicide	Section 3 label with reduced PHI (1 day for banded application, down from 45 days) now available
Trifloxystrobin	Flint	Fungicide	EPA PRIA date was December 2021; tolerance should to be set any day

An A.I. preceded by an asterisk (*) indicates that a label is currently available for growers to use.

Insecticide & Miticide Registrations in Oregon Caneberries – January 2021

Dani Lightle, Pesticide Registration Research Leader, Oregon State University

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This document is a guide and not intended as a recommendation or endorsement of the pesticides listed within. Trade names are given as examples only, and other products containing the same active ingredient may also be available. Target pests named are as listed on the product label(s) consulted for this document. Pesticide registrations and labels are subject to change at any time. Read pesticide labels carefully and consult with your supplier, field representative, pest consultant or OSU Extension Service Agent prior to pesticide use.

Active Ingredient	Example trade Name	IRAC ¹	REI ² (hours)	PHI ³ (days)	Aphids	Leafrollers	Root Weevils	Mites	Fruitworm	Thrips	SWD	Crown Borer	Others
Abamectin/Avermectin	AgriMek	6	12	7				\checkmark					
Acequinocyl	Kanemite	20B	12	1				\checkmark					
Acetamiprid	Assail	4A	12	1	\checkmark				\checkmark	\checkmark			leafhoppers
Beauveria bassiana	Mycotrol	UNF	4	0	\checkmark								many insects (see label)
Bifenazate	Acramite, Vigilant	20D	12	1				\checkmark					
Bifenthrin	Brigade	3A	12	3		\checkmark	\checkmark	\checkmark			>	\checkmark	
Bt	DiPel, Javelin, etc.	11A	4	0		~							other leps (see label)
Carbaryl	Sevin	1A	12	7	✓	✓			✓				other insects (see label)
Chlorantraniliprole	Altacor	28	4	3		✓						✓	
Cyantraniliprole	Exirel	28	12	1			✓				✓		
Diazinon	Diazinon	1B	5 days	7					~			~	
Etoxazolo		10P	12	,	v	v	v						
Fenbutatin-Oxide	Vendex (Raspberry only)	12B	48	3				▼ ✓					
Fenpropathrin	Danitol	3A	24	3		~		~	~		~		armyworm, leafhoppers, lygus bug, stinkbug
Fenpyroximate	FujiMite SC	21A	12	1									mites, leafhoppers
Flupyradifurone	Sivanto	4D	4	0	\checkmark								
Hexythiozox	Savey	10A	12	3				\checkmark					
Imidacloprid	Admire Pro (foliar)	4A	12	3	\checkmark					\checkmark			leafhoppers

Always remember – *the label is the law*.

Active Ingredient	Example trade Name	IRAC ¹	REI ²	PHI ³	Aphids	Leafrollers	Root Weevils	Mites	Fruitworm	Thrips	SWD	Crown Borer	Others
Imidacloprid	Admire Pro (soil)	4A	12	7	\checkmark								leafhoppers
Malathion	Malathion	1B	12	1	\checkmark			\checkmark		\checkmark			leafhoppers
Methoxyfenozide	Intrepid	18	4	3		\checkmark			\checkmark				armyworm
Neem	AzaDirect, etc.	UNE	4	0	\checkmark	\checkmark							other insects/mites
Oil	BioCover, 6E, etc.	UNE	4	0				✓					other insects (see label)
Propargite	Omite	12C	10	365				\checkmark					
Pyrethrin	Pyganic	3A	12	0	\checkmark	\checkmark							other insects (see label)
Pyriproxyfen	Esteem/Knack	7C	12	7					✓				scale
Soaps	Safer, M-Pede	?	12	0	✓								
Spinetoram	DelegateWG	5	4	1		✓			✓	✓	✓		armyworm, looper
Spinosad	Success, Entrust	5	4	1		✓			✓				armyworm, looper
Sulfoxaflor	Transform WG	4C	24	1	✓								leafhoppers
Tebufenozide	Confirm	18	4	14		✓							other leps (see label)
Thiamethoxam	Actara	4A	12	3	\checkmark		\checkmark						leafhoppers, stinkbugs
Tolfenpyrad	Bexar	21A	12	1	\checkmark	\checkmark					✓		leafhoppers
Zeta-cypermethrin	Mustang	3A	12	1		\checkmark	\checkmark						

¹IRAC: Insecticide (and Miticide) Resistance Action Committee Code Number. Insecticides/ Miticides with the same number should not be used consecutively, as they are similar in chemistry and/or mode of action and doing so may increase the risk of insecticide resistance.

²PHI: The preharvest interval (PHI) is the amount of time that must elapse between the last application of a pesticide and harvest of the crop. PHI (usually days) is found on the label in the use directions for each crop that is listed on the label.

³REI: All pesticide products have a prescribed-time restricted entry interval (REI) for worker protection. REI is clearly stated in the Agricultural Use Requirements section on the label. Generally, entry into treated areas during the prescribed time (usually hours) REI is not allowed unless Personal Protective Equipment (PPE) is worn or used.

Active Ingredients in **bold type** indicates some formulations are approved for organic production.

Fungicide Registrations in Oregon Caneberries – January 2021

Dani Lightle, Pesticide Registration Research Leader, Oregon State University

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Active Ingredient	Example Trade Name	FRAC ¹	REI ²	PHI ³	Anthracnose	Powdery Mildew	Botrytis	Septoria Leaf Spot	Spur Blight	Root Rot	Rust	Other
Aureobasidium pullulans	Botector	?	4	0	✓		\checkmark					
Azoxystrobin	Abound	11	4	0	\checkmark	✓		\checkmark	\checkmark		✓	
Azoxystrobin + propiconazole	QuiltXcel	11 + 3	12	30	✓	\checkmark		✓			\checkmark	
Bacillus subtilis	Serenade	?	4	0	\checkmark		\checkmark					
Boscalid + pyraclostrobin	Pristine	7 + 11	12	0	✓	\checkmark	\checkmark	\checkmark	\checkmark		~	
Calcium polysulfide	Lime Sulfur (Rex)	?	See label	Delayed dormant	✓	~		~	~		~	Cane blight
Captan	Captan	M4	48	3	✓		\checkmark		\checkmark			
Captan + fenhexamid	Captevate (Raspberry only)	M4+ 17	48	3	~		~		~			
Copper	Kocide, Champ, etc.	M1	48	0	~			~			~	Purple blotch
Cymoxanil + famoxadone	Tanos	27 + 11	12	0	\checkmark			\checkmark	\checkmark			
Cyprodinil + fludioxonil	Switch	9+12	12	0	\checkmark		\checkmark					
Fenhexamid	Elevate	17	12	0			\checkmark					
Fluopyram + pyrimethanil	Luna Tranquility	7+9	12	0		\checkmark	\checkmark	\checkmark				
Fosetyl-al	Aliette	33	12	60						\checkmark		
Iprodione	Rovral, Meteor	2	24	0			\checkmark					
Isofetamid	Kenja	7	12	7			\checkmark					
Mefenoxam	Ridomil Gold SL	4	48	45						\checkmark		

Active Ingredient	Example Trade Name	FRAC ¹	REI ²	PHI ³	Anthracnose	Powdery Mildew	Botrytis	Septoria Leaf Spot	Spur Blight	Root Rot	Rust	Other
Mefenoxam + Copper	Ridomil Gold											
Hydroxide	Copper	4 + M1	48	0								Downy mildew
Myclobutanil	Rally	3	24	0		\checkmark					\checkmark	
Oil	BioCover; Sun;	Э	Л	Delayed dormant or		1						
Ovathianinrolin	Orondis Gold 200	:		1		•				1		
Phosphorous acid	Fosphite, Phostrol	33	4	None listed		~				· •		Downy Mildew
Polyoxin-D	Ph-D. Oso	19	4	0	\checkmark	✓	\checkmark					
Potassium bicarbonate	Kaligreen	?	4	1		✓						
Penthiopyrad	Fontelis	7	12	0			\checkmark		\checkmark		\checkmark	
Propiconazole	Tilt, others	3	12	30		✓		\checkmark			✓	
Pyraclostrobin	Cabrio	11	12	0	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		✓	
Pyriofenone	Prolivo	50	4	0		✓						
Reynoutria sachalinensis	Regalia	P5	4	0	\checkmark	\checkmark	\checkmark				\checkmark	
Streptomyces lydicus	Actinovate	?	4	0			\checkmark					
Sulfur	Microthiol sp, etc	M2	24	None listed		\checkmark		\checkmark				Downy mildew

¹FRAC: Fungicide Resistance Action Committee Code Number. Fungicides with the same number should not be used consecutively, as they are similar in chemistry and/or mode of action and doing so may increase the risk of resistance.

²PHI: The preharvest interval (PHI) is the amount of time that must elapse between the last application of a pesticide and harvest of the crop. PHI (usually days) is found on the label in the use directions for each crop that is listed on the label.

³REI: All pesticide products have a prescribed-time restricted entry interval (REI) for worker protection. REI is clearly stated in the Agricultural Use Requirements section on the label. Generally, entry into treated areas during the prescribed time (usually hours) REI is not allowed unless Personal Protective Equipment (PPE) is worn or used.

Active Ingredients in **bold type** indicates some formulations are approved for organic production.

Herbicide and Misc. Registrations in Oregon Caneberries – January 2021

Dani Lightle, Pesticide Registration Research Leader, Oregon State University

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Active Ingredient	Example Trade Name	HRG ¹	REI ² (hours)	PHI ³ (days)	PRE	РОЅТ	Grass	Broadleaf	Others
Bentazon	Basagran	6	48	365 (non-bearing)		\checkmark		>	sedges
Caprylic & Capric acids	Suppress	?	24	0		\checkmark	\checkmark	\checkmark	
Carfentrazone-ethyl	Aim	14	12	15		~		~	Primocane suppression
Clethodim	Select Max; Arrow	1	24	7		\checkmark	\checkmark		
Dichlobenil	Casoron	20	12	Avoid new shoots	\checkmark			\checkmark	some grasses
Diquat dibromide	Reglone	22	24	365 (non-bearing)		\checkmark	\checkmark	\checkmark	
Diuron	Karmex	7	12	Late Spring or Fall	\checkmark		\checkmark	\checkmark	
Fluazifop	Fusilade	1	12	1		\checkmark	\checkmark		
Flumioxazin	Chateau	14	12	7	\checkmark			\checkmark	some grasses
Glyphosate	Roundup, Others	9	4	14		\checkmark	\checkmark	\checkmark	
Halosulfuron	Sandea	2	12	14	✓	✓		~	nutsedge
Indaziflam	Alion	29	12	Prior to bud swell	✓		✓	~	
Isoxaben	Trellis	21	12	60	✓			✓	
Mesotrione	Callisto	27	12	Pre-bloom	✓	✓		✓	
Napropamide	Devrinol	15	24	Spring/Fall use	✓		~	✓	
Norflurazon	Solicam	12	12	60	✓		~	✓	
Oryzalin	Surflan	3	24	Spring or Fall use	✓		~	✓	
				Raspberry = 50					Primocane
Oxyfluorfen	Goal	14	24	Blackberry = 15	\checkmark	\checkmark		\checkmark	suppression
Paraquat	Gramoxone	22	24	Avoid new shoots		\checkmark	\checkmark	\checkmark	
Pelargonic acid	Scythe	17	12	1		\checkmark	\checkmark	\checkmark	

Active Ingredient	Example Trade Name	HRG ¹	REI ² (hours)	PHI ³ (days)	PRE	POST	Grass	Broadleaf	Others
Pronamide	Kerb	3	24	Fall or Winter use	\checkmark		\checkmark	\checkmark	
Quinclorac	Quinstar	4	12	30	\checkmark	✓	✓	✓	
Rimsulfuron	Matrix	2	4	21	✓	✓	✓	✓	
Sethoxydim	Poast	1	12	45		✓	✓		
Simazine	Simazine; Princep	5	12	Spring or Fall use	\checkmark		✓	✓	
S-metolachlor	Dual Magnum	15	24	28	\checkmark		✓	\checkmark	nutsedge
Sulfentrazone	Zeus XC	14	12	3	\checkmark		✓	\checkmark	nutsedge
Terbacil	Sinbar	5	12	70	\checkmark		\checkmark	\checkmark	

¹HRG: Herbicide Rotation Guide (from the Weed Science Society of America). Based on mode of action. To avoid selecting for herbicideresistant weeds, do not use herbicides from the same group more than once within three years. Rather, rotate to a different group every year of the production system.

²PHI: The preharvest interval (PHI) is the amount of time that must elapse between the last application of a pesticide and harvest of the crop. PHI (usually days) is found on the label in the use directions for each crop that is listed on the label.

³REI: All pesticide products have a prescribed-time restricted entry interval (REI) for worker protection. REI is clearly stated in the Agricultural Use Requirements section on the label. Generally, entry into treated areas during the prescribed time (usually hours) REI is not allowed unless Personal Protective Equipment (PPE) is worn or used.

Active Ingredients in **bold type** indicates some formulations are approved for organic production.

		REI ¹		
Active Ingredient	Example Trade Name	(hours)	PHI ² (days)	Purpose (as listed on label)
	Ethrel			
Ethephon	(Blackberry only)	48	3	PGR, promotes fruit ripening
Iron Phosphate	Sluggo	0	0	Slugs and snails
Metaldehyde	Deadline, others	12	0	Slugs and snails
Zinc Phosphide	Prozap ZP Pellets	?	70 (Dormant use only)	Rodents (voles)

Misc.

¹REI: All pesticide products have a prescribed-time restricted entry interval (REI) for worker protection. REI is clearly stated in the Agricultural Use Requirements section on the label. Generally, entry into treated areas during the prescribed time (usually hours) REI is not allowed unless Personal Protective Equipment (PPE) is worn or used.

²PHI: The preharvest interval (PHI) is the amount of time that must elapse between the last application of a pesticide and harvest of the crop. PHI (usually days) is found on the label in the use directions for each crop that is listed on the label.

Raspberry Maximum Residue Limits (MRLs) for USA and Foreign Trade Markets - Insecticides

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Active Ingredient	Example Trade Name	VSN	Australia	Canada	China	CODEX	EU	Great Britain	Hong Kong	Japan	Korea	Taiwan
Abamectin	AgriMek	0.2	0.2	0.2	0.2	0.2	{0.08}	{0.08}		{0.05}	{0.05}	{0.02}
Acequinocyl	Kanemite	4		4	{0.01}		{0.01}	{0.01}		{0.01}	{0.5}	
Acetamiprid	Assail	1.6	2	4	2	2	2	2		2	{1}	{1}
Bifenazate	Acramite	5	7	5		7	7	7		7	{0.5}	
Bifenthrin	Brigade	1	3	1		1	1	1	1	1	{0.3}	1
Carbaryl	Sevin	12	15	{10}			{0.01}	{0.01}		12	{0.5}	{0.5}
Chlorantraniliprole	Altacor	1.8	2.5	{0.9}	{1}	{1}	{1}	{1}	{1}	2	{1}	1.8
Cyantraniliprole	Exirel	4	{0.05}	4	4		{0.01}	{0.01}		{0.01}	{0.3}	
Diazinon	Diazinon	0.75	{0.5}	{0.1}		{0.2}	{0.01}	{0.01}	{0.2}	{0.2}	{0.01}	{0.5}
Esfenvalerate	Asana	1	1	{0.1}	{0.2}		{0.02}	{0.02}	{0.2}	1	{0.01}	1
Etoxazole	Zeal	1.5	{0.5}	1.5			{0.01}	{0.01}		{0.01}	{0.2}	{0.01}
Fenbutatin-Oxide	Vendex	10	{1}	{0.1}			{0.01}	{0.01}	10	10	{0.01}	
Fenpropathrin	Danitol	12		12	{5}		{0.01}	{0.01}	{5}	12	{0.01}	{3}
Fenpyroximate	FujiMite	3	{1.5}	{0.1}		{0.2}	{1.5}	{1.5}		{0.2}	{0.7}	{0.5}
Flupyradifurone	Sivanto	5	{0.02}	5		6	{1.5}	{1.5}		{0.01}	{1}	
Hexythiazox	Savey	3	{1}	{1.5}			{0.5}	{0.5}		{0.01}	{0.01}	{1}
Imidacloprid	Admire	2.5	5	2.5	5	5	5	5	5	4	{1.5}	{1}
Malathion	Malathion	8	10	8			{0.02}	{0.02}	8	8	{6}	{0.01}
Methoxyfenozide	Intrepid	6	{0.03}	6			{0.01}	{0.01}		6	{1}	{0.01}
Pyrethrins	Pyganic	1	1	1			1	1		1	{0.01}	
Pyriproxyfen	Esteem	1	{0.1}	{0.1}			{0.05}	{0.05}		{0.01}	{0.01}	{0.5}
Spinetoram	Delegate	0.8	{0.5}	{0.5}	0.8	0.8	1	1		0.8	{0.7}	{0.5}
Spinosad	Entrust	1	{0.7}	{0.5}		1	1.5	1.5		1	{0.5}	1
Sulfoxaflor	Transform	1.5	{1}	{0.1}			{0.01}	{0.01}		{0.01}	{0.5}	
Tebufenozide	Confirm	3	{0.05}	{0.1}		{2}	{2}	{2}	{2}	{2}	{2}	{2}
Thiamethoxam	Actara	0.35	0.5	0.5	0.5	0.5	{0.01}	{0.01}	0.5	0.5	1	0.5
Tolfenpyrad	Bexar	7		{0.1}			{0.01}	{0.01}		{0.01}	{0.01}	{0.01}
Zeta-cypermethrin	Mustang	0.8	{0.5}	0.8			{0.5}	{0.5}		{0.5}	{0.01}	2

Current as of: December 27, 2021

All MRLs listed in ppm

{ } = indicate a MRL that is lower than US tolerances

Blackberry Maximum Residue Limits (MRLs) for USA and Foreign Trade Markets - Insecticides

Dani Lightle, Pesticide Registration Research Leader, Oregon State University

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Active Ingredient	Example Trade Name	VSU	Australia	Canada	China	CODEX	EU	Great Britain	Hong Kong	Japan	Korea	Taiwan
Abamectin	AgriMek	0.2	0.2	0.2	0.2	0.2	{0.08}	{0.08}		{0.05}	{0.05}	{0.02}
Acequinocyl	Kanemite	4		4	{0.01}		{0.01}	{0.01}		{0.01}	{0.5}	
Acetamiprid	Assail	1.6	{0.1}	4	2	2	2	2		2	{1}	{1}
Bifenazate	Acramite	5	7	5	7	7	7	7		7	{0.5}	
Bifenthrin	Brigade	1	3	1	1	1	1	1	1	1	{0.3}	1
Carbaryl	Sevin	12	{0.02}	{10}			{0.01}	{0.01}		12	{0.5}	{0.5}
Chlorantraniliprole	Altacor	1.8	2.5	{0.9}	{1}	{1}	{1}	{1}	{1}	2	{1}	1.8
Cyantraniliprole	Exirel	4	{0.05}	4	4		{0.01}	{0.01}		{0.01}	{0.3}	
Diazinon	Diazinon	0.75	{0.5}	{0.1}	{0.1}	{0.1}	{0.01}	{0.01}	{0.1}	{0.1}	{0.01}	{0.5}
Esfenvalerate	Asana	1	1	{0.1}	{0.2}		{0.02}	{0.02}	{0.2}	1	3	1
Etoxazole	Zeal	1.5	{0.5}	1.5			{0.01}	{0.01}		{0.01}	{0.2}	{0.01}
Fenpropathrin	Danitol	12		12	{5}		{0.01}	{0.01}	{5}	12	{0.01}	{3}
Fenpyroximate	FujiMite	3	{0.1}	{0.1}			{0.7}	{0.7}		{0.01}	{0.7}	{0.5}
Flupyradifurone	Sivanto	5	{0.02}	5		6	{1.5}	{1.5}		{0.01}	{1}	
Hexythiazox	Savey	3	{1}	{1.5}			{0.5}	{0.5}		{0.01}	{0.01}	{1}
Imidacloprid	Admire	2.5	5	2.5	5	5	5	5	5	4	{1.5}	{1}
Malathion	Malathion	8	10	8			{0.02}	{0.02}	8	8	{6}	{0.01}
Methoxyfenozide	Intrepid	6	{0.03}	6			{0.01}	{0.01}		6	{1}	{0.01}
Pyrethrins	Pyganic	1	1	1			1	1	1	1	1	
Pyriproxyfen	Esteem	1	{0.1}	{0.1}			{0.05}	{0.05}		{0.01}	{0.01}	{0.5}
Spinetoram	Delegate	0.8	{0.5}	{0.5}			1	1		{0.7}	{0.7}	
Spinosad	Entrust	1	{0.7}	{0.5}	1	1	1.5	1.5		1	{0.5}	1
Sulfoxaflor	Transform	1.5	{1}	{0.1}			{0.01}	{0.01}		{0.01}	{0.5}	
Tebufenozide	Confirm	3	{0.05}	{0.1}			{0.01}	{0.01}	3	3	{2}	{0.01}
Thiamethoxam	Actara	0.35	0.5	0.5	0.5	0.5	{0.01}	{0.01}	0.5	0.5	1	0.5
Tolfenpyrad	Bexar	7		{0.1}			{0.01}	{0.01}		{0.01}	{0.01}	{0.01}
Zeta-cypermethrin	Mustang	0.8	{0.5}	0.8			{0.5}	{0.5}		{0.5}	2	2

Current as of: December 27, 2021

All MRLs listed in ppm

{ } = indicate a MRL that is lower than US tolerances

Raspberry Maximum Residue Limits (MRLs) for USA and Foreign Trade Markets - Fungicides

Dani Lightle, Pesticide Registration Research Leader, Oregon State University

danielle.lightle@oregonstate.edu

Current as of: December 27, 2021

Active Ingredient	Example Trade Name	NSA	Australia	Canada	China	CODEX	EU	Great Britain	Hong Kong	Japan	Korea	Taiwan
Azoxystrobin	Abound	5	5	5	5	5	5	5	5	5	{3}	5
Captan	Captan	25	30	{5}		{20}	{20}	{20}	{20}	{20}	{5}	{20}
Fenhexamid	Elevate	20	20	20	{5}	{15}	{15}	{15}	{15}	{15}	{5}	
Fosetyl-al	Aliette	0.1	100	0.1			300	300		70	1	20
Iprodione	Rovral	15	{12}	25		30	{0.01}	{0.01}	30	{5}	30	{5}
Isofetamid	Kenja	4	5	4		{3}	{3}	{3}		4	{0.01}	
Mefenoxam	Ridomil Gold	0.7	{0.5}	{0.2}		{0.2}	{0.02}	{0.02}	{0.2}	{0.2}	{0.2}	1
Myclobutanil	Rally	2	2	2			{0.01}	{0.01}		2	{0.01}	{0.5}
Oxathiapiprolin	Orondis Gold	0.5	0.5	0.5		0.5	0.5	0.5		0.5	0.5	
Penthiopyrad	Fontelis	10	{0.05}	10		10	{0.01}	{0.01}		{0.01}	{0.5}	
Propiconazole	Tilt	1	1	1			{0.01}	{0.01}		{0.05}	{0.01}	{0.5}
Pyraclostrobin	Cabrio	4	4	{3.5}		{3}	{3}	{3}	{2}	{3}	{3}	{3}
Pyriofenone	Prolivo	0.9	0.9	0.9		0.9	0.9	0.9		0.9	{0.01}	
	•		F	ungicide	pre-mixt	ure form	ulations					
Azoxystrobin +		5	5	5	5	5	5	5	5	5	{3}	5
propiconazole	QuiltXcel	1	1	1			{0.01}	{0.01}		{0.05}	{0.01}	{0.5}
Boscalid +		10	10	{6}	10	10	10	10	10	10	{9}	{6}
pyraclostrobin	Pristine	4	4	{3.5}		{3}	{3}	{3}	{2}	{3}	{3}	{3}
Captan +		25	30	{5}		{20}	{20}	{20}	{20}	{20}	{5}	{20}
fenhexamid	Captevate	20	20	20	{5}	{15}	{15}	{15}	{15}	{15}	{5}	
Cymoxanil +		4		4			{0.01}	{0.01}		4	{0.01}	{1}
famoxadone	Tanos	10	10	10			{0.01}	{0.01}		10	{0.01}	{0.01}
Cyprodinil +		10	10	10	10	10	{3}	{3}	10	10	10	{3}
fludioxonil	Switch	5	5	7		5	5	5	5	5	5	5
Fluopyram +	Luna	5	5	5	{3}	5	5	5		5	{0.01}	
pyrimethanil	Tranquility	15	15	15	15	15	15	15		{10}	15	{10}
Mefenoxam +	Ridomil Gold	0.7	{0.5}	{0.2}		{0.2}	{0.02}	{0.02}	{0.2}	{0.2}	{0.2}	1
Copper Hydroxide	Copper	exempt	exempt	exempt	exempt	exempt	exempt	exempt	exempt	exempt	exempt	exempt

All MRLs listed in ppm

{ } = indicate a MRL that is lower than US tolerances

Blackberry Maximum Residue Limits (MRLs) for USA and Foreign Trade Markets - Fungicides

Dani Lightle, Pesticide Registration Research Leader, Oregon State University

danielle.lightle@oregonstate.edu

Current as of: December 27, 2021

Active Ingredient	Example Trade Name	USA	Australia	Canada	China	CODEX	EU	Great Britain	Hong Kong	Japan	Korea	Taiwan
Azoxystrobin	Abound	5	5	5	5	5	5	5	5	5	{3}	{2}
Captan	Captan	25	30	{0.1}			{20}	{20}		{0.01}	{5}	{20}
Fenhexamid	Elevate	20	20	20	{15}	{15}	{15}	{15}	{15}	{15}	{5}	
Fosetyl-al	Aliette	0.1		0.1		70	300	300		70	1	20
Iprodione	Rovral	25	{12}	25	30	30	{0.01}	{0.01}	30	{12}	30	{5}
Isofetamid	Kenja	4	5	4		{3}	{3}	{3}		4	{0.01}	
Mefenoxam	Ridomil Gold	0.7	{0.5}	{0.1}			{0.02}	{0.02}		0.7	{0.2}	1
Myclobutanil	Rally	2	2	2			{0.8}	{0.8}		2	{0.01}	{0.5}
Oxathiapiprolin	Orondis Gold	0.5	0.5	0.5		0.5	0.5	0.5		0.5	0.5	
Penthiopyrad	Fontelis	10	{0.05}	10		10	{0.01}	{0.01}		{0.01}	{0.5}	
Propiconazole	Tilt	1	1	1			{0.01}	{0.01}		{0.05}	{0.01}	1
Pyraclostrobin	Cabrio	4	4	{3.5}	{3}	{3}	{3}	{3}		{3}	{3}	{3}
Pyriofenone	Prolivo	0.9	0.9	0.9		0.9	0.9	0.9		0.9	{0.01}	
			F	ungicide	pre-mixt	ure form	ulations					
Azoxystrobin +		5	5	5	5	5	5	5	5	5	{3}	{2}
propiconazole	QuiltXcel	1	1	1			{0.01}	{0.01}		{0.05}	{0.01}	1
Boscalid +		10	10	{6}	10	10	10	10	10	10	{9}	{6}
pyraclostrobin	Pristine	4	4	{3.5}	{3}	{3}	{3}	{3}		{3}	{3}	{3}
Cymoxanil +		4		4			{0.01}	{0.01}		4	{0.01}	{1}
famoxadone	Tanos	10		10			{0.01}	{0.01}		10	{0.01}	{0.01}
Cyprodinil +		10	10	10	10	10	{3}	{3}		10	10	{3}
fludioxonil	Switch	5	5	7	5	5	5	5	5	5	5	5
Fluopyram +	Luna	5	{0.2}	5	{3}	5	5	5		5	6	{2}
pyrimethanil	Tranquility	15	15	15	15	15	15	15		{10}	15	{4}
Mefenoxam +	Ridomil Gold	0.7	{0.5}	{0.1}			{0.02}	{0.02}		0.7	{0.2}	1
Copper Hydroxide	Copper	exempt	exempt	exempt	exempt	exempt	exempt	exempt	exempt	exempt	exempt	exempt

All MRLs listed in ppm

{ } = indicate a MRL that is lower than US tolerances

Raspberry Maximum Residue Limits (MRLs) for USA and Foreign Trade Markets - Herbicides

Dani Lightle, Pesticide Registration Research Leader, Oregon State University

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Current as of: December 27, 2021

Active Ingredient	Example Trade Name	VSU	Australia	Canada	China	CODEX	EU	Great Britain	Hong Kong	Japan	Korea	Taiwan
Carfentrazone	Aim	0.1	{0.05}	0.1			{0.02}	{0.01}	0.1	0.1	0.1	0.1
Clethodim	Select Max	0.3	{0.1}	{0.1}			{0.1}	{0.1}		{0.01}	{0.01}	
Dichlobenil	Casoron	0.1	1	0.1	0.2	0.2	{0.01}	{0.01}		{0.01}	{0.01}	
Diuron	Karmex	0.1	{0.05}	0.1			{0.01}	{0.01}	0.1	{0.05}	{0.01}	
Fluazifop	Fusilade	0.08	0.2	0.08	{0.01}	0.08	{0.01}	{0.01}		{0.01}	{0.01}	{0.01}
Flumioxazin	Chateau	0.5	{0.02}	0.5			{0.02}	{0.02}		{0.01}	{0.01}	
Glyphosate	Roundup	0.2	{0.05}	{0.1}	{0.1}		{0.1}	{0.1}	0.2	0.2	0.2	0.2
Halosulfuron	Sandea	0.05	0.05	0.05			{0.01}	{0.01}		0.05	{0.01}	
Indaziflam	Alion	0.01		0.01			0.01	0.01		0.01	0.01	
Isoxaben	Trellis	0.01		0.1			0.05	0.05		0.01	0.01	
Mesotrione	Callisto	0.01	0.01	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Napropamide	Devrinol	0.1	0.1	0.1			{0.01}	{0.01}	0.1	0.1	{0.01}	{0.01}
Norflurazon	Solicam	0.2	{0.05}	{0.1}			{0.01}	{0.01}		0.2	{0.01}	
Oryzalin	Surflan	0.05	0.1	0.1			{0.01}	{0.01}	0.05	0.08	{0.01}	
Oxyfluorfen	Goal	0.05		0.05			0.05	0.05		{0.01}	{0.01}	{0.01}
Paraquat	Gramoxone	0.05	0.05	0.05	{0.01}	{0.01}	{0.02}	{0.02}	{0.01}	0.05	{0.01}	{0.01}
Pronamide (propyzamide)	Kerb	0.05	{0.02}	0.1			{0.01}	{0.01}		{0.01}	{0.01}	
Quinclorac	Quinstar 4L	0.08		0.1			{0.01}	{0.01}		{0.01}	{0.01}	
Rimsulfuron	Matrix	0.01		0.01			0.01	0.01		0.01	0.01	
Sethoxydim	Poast	5	{0.1}	5			{0.1}	{0.1}		{0.01}	{0.01}	{0.5}
Simazine	Simazine	0.2	{0.1}	{0.1}			{0.01}	{0.01}		0.2	{0.01}	0.2
S-metolachlor	Dual Magnum	0.1		0.1			{0.05}	{0.05}		{0.01}	{0.01}	{0.01}
Sulfentrazone	Zeus XC	0.15		0.15			{0.01}	{0.01}		{0.05}	{0.01}	
Terbacil	Sinbar	0.2		{0.1}			{0.01}	{0.01}		{0.1}	{0.01}	

All MRLs listed in ppm

{ } = indicate a MRL that is lower than US tolerances

--- = no MRL established in that market

Raspberry Maximum Residue Limits (MRLs) for USA and Foreign Trade Markets – Misc. Materials

Active Ingredient	Example Trade Name	VSU	Australia	Canada	China	CODEX	EU	Great Britain	Hong Kong	Japan	Korea	Taiwan
Metaldehyde	Deadline	0.15	1	0.15			{0.05}	{0.05}	0.15	{0.01}	{0.01}	

Blackberry Maximum Residue Limits (MRLs) for USA and Foreign Trade Markets - Herbicides

Dani Lightle, Pesticide Registration Research Leader, Oregon State University

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Current as of: December 27, 2021

Active Ingredient	Example Trade Name	VSU	Australia	Canada	China	CODEX	EU	Great Britain	Hong Kong	Japan	Korea	Taiwan
Carfentrazone	Aim	0.1	{0.05}	0.1			{0.02}	{0.01}	0.1	0.1	0.1	
Clethodim	Select Max	0.3	{0.1}	{0.1}			{0.1}	{0.1}		{0.01}	{0.01}	
Dichlobenil	Casoron	0.1		0.1	0.2	0.2	{0.01}	{0.01}		{0.01}	{0.01}	
Diuron	Karmex	0.1	{0.05}	0.1			{0.01}	{0.01}	0.1	{0.05}	{0.01}	
Fluazifop	Fusilade	0.08	0.2	0.08	{0.01}	0.08	{0.01}	{0.01}		{0.01}	{0.01}	{0.01}
Flumioxazin	Chateau	0.5	{0.02}	0.5			{0.02}	{0.02}		{0.01}	{0.01}	
Glyphosate	Roundup	0.2	{0.05}	{0.1}	{0.1}		{0.1}	{0.1}	0.2	0.2	0.2	0.2
Halosulfuron	Sandea	0.05		0.05			{0.01}	{0.01}		0.05	{0.01}	
Indaziflam	Alion	0.01		0.01			0.01	0.01		0.01	0.01	
Isoxaben	Trellis	0.01		0.1			0.05	0.05		0.01	0.01	
Mesotrione	Callisto	0.01	0.01	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Napropamide	Devrinol	0.1	0.1	0.1			{0.01}	{0.01}	0.1	0.1	{0.01}	{0.01}
Norflurazon	Solicam	0.1	{0.05}	0.1			{0.01}	{0.01}	0.1	0.1	{0.01}	
Oryzalin	Surflan	0.05	0.1	0.1			{0.01}	{0.01}	0.05	0.08	{0.01}	
Oxyfluorfen	Goal	0.05		0.1			0.05	0.05	0.05	{0.01}	{0.01}	{0.01}
Paraquat	Gramoxone	0.05	0.05	0.05	{0.01}	{0.01}	{0.02}	{0.02}	{0.01}	0.05	{0.01}	{0.01}
Pronamide (propyzamide)	Kerb	0.05	{0.02}	0.1			{0.01}	{0.01}	0.05	{0.01}	{0.01}	
Quinclorac	Quinstar 4L	0.08		0.1			{0.01}	{0.01}		{0.01}	{0.01}	
Rimsulfuron	Matrix	0.01		0.01			0.01	0.01		0.01	0.01	
Sethoxydim	Poast	5	{0.1}	5			{0.1}	{0.1}		{0.01}	{1}	
Simazine	Simazine	0.2	{0.1}	{0.1}			{0.01}	{0.01}	0.2	0.2	{0.01}	
S-metolachlor	Dual Magnum	0.1		0.1			{0.05}	{0.05}		{0.01}	{0.01}	{0.01}
Sulfentrazone	Zeus XC	0.15		0.15			{0.01}	{0.01}		{0.05}	{0.01}	
Terbacil	Sinbar	0.2		{0.1}			{0.01}	{0.01}		{0.1}	{0.01}	

All MRLs listed in ppm

{ } = indicate a MRL that is lower than US tolerances

--- = no MRL established in that market

Blackberry Maximum Residue Limits (MRLs) for USA and Foreign Trade Markets – Misc. Materials

Active Ingredient	Example Trade Name	NSA	Australia	Canada	China	CODEX	EU	Great Britain	Hong Kong	Japan	Korea	Taiwan
Ethephon	Ethrel	30	{0.1}	{20}			{0.05}	{0.05}	30	{2}	{0.01}	{2}
Metaldehyde	Deadline	0.15	1	0.15			{0.05}	{0.05}	0.15	{0.01}	{0.01}	

Progress Report to the Agricultural Research Foundation, 2021-2022

Title: Cooperative breeding program - Caneberries

Principal investigators:	Bernadine Strik, Professor, Horticulture Berry Crops Research Leader, NWREC Pat Jones, Senior Faculty Research Assistant I, NWREC Michael Hardigan, Research Geneticist, USDA-ARS, HCRU
Collaborators:	Mary Peterson, USDA-ARS Technician
	Amanda Davis, Senior Faculty Research Assistant I, NWREC
Cooperators:	Wendy Hoashi-Erhardt. WSU, Puyallup
	Michael Dossett; Agriculture and Agri-Foods Canada
	Zak Weigand, OSU, Dept. Food Science & Tech.
	Enfield Farms/Northwest Plants
	North American Plants
	Northwest Plants
	Oregon berry growers
	Littau Harvesters Inc.

Objectives:

- To develop new blackberry cultivars for the Pacific Northwest that are high yielding, thornless, winter tolerant, adapted to mechanical harvesting, and that have excellent fruit quality. While the primary emphasis is on blackberries with excellent processed fruit quality, high quality fresh market cultivars will be pursued as well.
- To develop raspberry cultivars for the Pacific Northwest in cooperation with Agriculture and Agri-Foods Canada and Washington State University that are high-yielding, machine harvestable, disease/virus resistant and that have superior processed fruit quality. While the priority will be on the processed market, fresh market cultivars will be pursued as well.
- To evaluate black raspberry selections and cultivars for their adaptation to the Pacific Northwest and to develop selections that combine similar processed fruit quality to 'Munger' with greater yields and plant longevity (disease tolerance and aphid resistance).
- To collect, evaluate and incorporate new *Rubus* germplasm into the breeding program.

Rubus

Progress - Blackberry

Blackberry breeding remains the greatest focus of the USDA-ARS-HCRU caneberry breeding program. Through our historic cooperation with Oregon State University's Department of Horticulture, we are able to conduct advanced selection trials and screening at the OSU North Willamette Research and Extension Center (OSU-NWREC). We are developing thornless, machine harvestable blackberry cultivars for PNW growers. These have historically included trailing blackberry varieties, and more recently, incorporating genetics from eastern US types. Our current objective is to identify thornless selections with better firmness and machine harvestable yield and fruit quality than 'Black Diamond', 'Columbia Star', and 'Marion'. Building on the work of Dr. Chad Finn, we are continuing efforts to adapt eastern US semierect and primocane blackberry material to

the PNW, and experimenting with incorporating their genetics into PNW trailing types, with promising results. Our objective is to develop varieties with improved hardiness and fresh quality, while maintaining the exceptional flavor of traditional Northwest trailing varieties. We are preparing to release ORUS 4222-1, a thornless trailing type for machine harvest and processing that can compete with 'Black Diamond', ORUS 4670-1, a thornless semierect type with yield comparable to the industry standard 'Chester Thornless' and with significantly improved flavor, and ORUS 4999-2, an erect primocane-fruiting type with exceptional plant vigor and yield for fresh market.

Cultivar Releases

Pending Patent Approval

- ORUS 4222-1 A thornless and high yielding selection. In multiple trial years it has shown similar, sometimes greater yield potential than 'Columbia Star'. Compared with 'Columbia Star', ORUS 4222-1 produces larger numbers of smaller 'Marion'-sized fruit, with a notably uniform conical shape, and good firmness to support machine harvest. The fruit are sweet, with higher soluble solids than trailing cultivars 'Columbia Star', 'Black Diamond', and 'Hall's Beauty'. Ripens one week later than 'Columbia Star'.
- ORUS 4670-1 This thornless semierect blackberry selection had similar or greater yields to 'Chester Thornless' in 2018-19, and significantly greater yields than 'Chester Thornless' in 2020. Ripens 10-14 days ahead of 'Chester Thornless', closer to 'Triple Crown', but harvest season extends 14 d beyond 'Triple Crown'. It has similar fruit size and firmness to 'Chester Thornless', but much better flavor. The fruit showed at least as good post-harvest quality as 'Chester Thornless'.
- ORUS 4999-2 An early-ripening, high-yielding primocane-fruiting blackberry. The plants are vigorous and productive, with fruit that ripen with or are earlier than 'Prime-Ark® 45'. Yields on two-year-old plots were twice as high as three-year-old plots of 'Prime-Ark® 45' in 2019, and 44% higher than 'Prime-Ark® 45' in 2021 (2019 trial). The fruit are medium sized for a primocane type, firm, tough-skinned, with good sweetness. The canes are vigorous and establish quickly, with the potential to produce a year-one 'baby crop' competitive with 2nd-year yields of other selections. Ranked highest for flavor among all primocane samples in the most recent OSU Food Science fruit cutting.

Future Releases

- ORUS 4535-1 A dwarf, thornless trailing blackberry for homeowner market. While a floricane type, it has short internodes, and its 0.60-0.75 m (2-2.5 ft.) long canes will cascade out of containers. The fruit quality is fine but not exceptional.
- **ORUS 4928-1** A sterile, ornamental pink flowering semi-erect blackberry that is of interest to cut flower growers.

Nursery/Propagation List

In addition to any above current/future variety releases, the following have been/are being propagated for grower trials:

• (NEW) ORUS 4344-3 – A thornless and high yielding selection with excellent fruit quality, average yield was higher than 'Columbia Star' and 'Black Diamond' in 2020 and 2021. Genetic background is 1/2 trailing, 1/4 erect primocane, 1/8 semierect, and 1/8 wild *R*. *ursinus*, and behaves like a mid-to-late season trailing type. Showed excellent fruit quality and resilience during heatwave compared to traditional trailing types.

- (NEW) ORUS 4892-2 A thornless trailing selection that has yielded higher than 'Columbia Star' for two seasons, with very good firmness, skin toughness, and overall fruit quality.
- **ORUS 4663-1** A thornless and high yielding selection with excellent fruit quality, average yield was higher than 'Columbia Star' and 'Black Diamond' from 2018-20, and significantly higher than both in 2020. Fruit is large for a trailing type, has good texture and terrific flavor, separates well, but lacks firmness of 'Columbia Star'. Might be suited for fresh.
- **ORUS 4024-3** *Will be removed after 2021.* A specialty variety selected as a machineharvestable 'Tayberry' type of blackberry, with very attractive glossy, burgundy-colored fruit. Has 'Willamette' red raspberry as a grandparent. Picks easily and has wonderful flavor. Has the growth habit of a thorny trailing type.
- ORUS 4902-1 Will be removed after 2021.

Grower Trials – Northern Washington (Enfield Farms)

Since 2001, we have actively trialed OR blackberry selections at Enfield Farms (Lynden, WA), which sits on the Canadian border, to evaluate winter hardiness and machine harvestability in a commercial setting. Most but not all selections have been machine harvestable.

- Semierect variety 'Twilight' performed well in northern WA trials with high plant vigor, low winter injury, and high machine harvestable yield in 2021.
- Semierect selection **ORUS 4670-1** was susceptible to winter injury in northern WA.
- Trailing variety 'Columbia Star' showed low winter injury in 2021.
- Trailing selection **ORUS 5014-1** performed well in WA and OR trials, with low winter injury and good machine harvest fruit release in WA, and high yields in OR.
- Trailing selection **ORUS 5023-1** showed good machine harvest fruit release and flavor, low acid and high sugar, low winter injury.

Grower Trials – Oregon (OSU-NWREC)

2017 Trailing Blackberry Trials (Table Bk-TR 1)

- 'Columbia Star' and ORUS 4222-1 (REP; patent pending) have shown the highest yearto-year overall consistency in the 2017 replicated trial when including 2021 heatwaveimpacted yield data. Both lost significant numbers of fruit to acute heat damage but bounced back relatively well in July.
- **ORUS 4892-1 (REP)** was more heavily impacted by heatwave damage in 2021 than 'Columbia Star' and ORUS 4222-1 due to its season/ripening stage, however, it outperformed 'Columbia Star' in 2019-20, and has shown good fruit quality and flavor, size may be suitable for fresh.

2018 Trailing Blackberry Trials (Table Bk-TR 2)

- 'Columbia Star' and 'Black Diamond' suffered severe fruit damage in this trial in 2021.
- ORUS 4344-3 (REP) has been the top performer in both trial years, producing 50% more yield than 'Columbia Star' in 2020 and 41% in 2021, and showed greater heat tolerance than any trailing blackberry selection or cultivar in 2021.
- ORUS 4344-3 (REP) and ORUS 4892-2 (REP) were selections that demonstrated better fruit quality and recovery following heat stress than other trailing selections and cultivars, with less total fruit loss and fewer unmarketable fruit in subsequent harvests.

2019 Trailing Blackberry Trials (Table Bk-TR 3)

- 'Columbia Star' and Black Diamond' performed similarly, both suffered significant heat damage in late June and early July.
- **ORUS 5037-1 (REP)** initially shows excellent yields, significantly more productive than trailing cultivar standards. Fruit have VERY good flavor, however, lacking the skin toughness of 'Columbia Star'. Possibly an impact of heat damage, need more data.
- **ORUS 4222-1 (OBS; patent pending)** observation plot performed very well, with highest yields in 2019 trial.
- **ORUS 5014-1 (OBS)** showed higher yield potential than cultivar standards due to big late season picks of large, beautiful fruit with very good flavor. Not sure if will machine pick, would like to see in grower trial.

2017-19 Semierect Blackberry Trials (Table Bk-SE 1)

- 'Chester Thornless' remains the yield standard for our program, consistently produces large quantities of edible fruit each trial year.
- 2017 ORUS 4928-2 (OBS) and ORUS 4926-1 (OBS) showed high yield potential in 2017 trials but lacked the combination of excellent flavor and fruit quality for fresh market.
- 2017 ORUS 4929-2 (OBS) consistently outperformed 'Triple Crown' and produced very attractive conical fruit with excellent fresh market quality (texture, firmness, skin toughness) and a unique flavor containing floral aromas and ideal sugar/acid balance. Contains 1/16th *R*. *caucasicus* in its pedigree.
- 2019 ORUS 5057-1 (OBS) approached the yield of 'Chester Thornless' with larger, more attractive fruit, however fruit showed similar firmness and quality to 'Triple Crown' and may be too soft for fresh market.
- 2019 ORUS 5058-2 (OBS) produced similar yields to 'Triple Crown', fruit are larger with very high firmness and skin toughness for their size, high gloss, and are sweet with low acidity and a perfume-like aroma.
- 2019 ORUS 5067-1 (OBS) had decent yield and good flavor, very good firmness and skin toughness.

2017 Primocane Blackberry Trials (Table Bk-PR 1)

• **ORUS 4999-2 (REP)** has significantly outcompeted all other selections in the program and cultivar standards, with its exceptional vigor combined with a larger number of fruits-per-lateral. Will likely become the program yield standard in future seasons.

2018 Primocane Blackberry Trials (Table Bk-PR 2)

- **ORUS 5068-3 (REP)** has good yields but is not competitive with ORUS 4999-2 or current primocane cultivar standards from Arkansas. It has excellent fruit quality; berries are firm, uniform, and glossy with a citrusy flavor and reduced bitterness compared to current primocane types. Parental material.
- **ORUS 5069-1 (OBS)** stands out for producing larger numbers of smaller berries that combine exceptional firmness with good sweetness and reduced bitter aftertaste.

2019 Primocane Blackberry Trials (Table Bk-PR 3)

- **ORUS 4999-2 (REP)** showed competitive yields with 'Prime-Ark 45', will be released as a new variety and used as primocane yield standard for program.
- **ORUS 5174-2 (REP)** showed competitive yields with 'Prime-Ark 45' in its first harvest season. Fruit still contains some bitterness.

By the Numbers: Crosses, Seedlings & Selections

In 2021:

- We attempted 64 blackberry crosses, with 32 trailing, 24 semierect, and 8 erect primocane families.
- We did not plant a seedling field; 2020 crosses held for the hire of a new caneberry breeder.
- We made 63 new blackberry selections from the 2019 seedling population to be planted in the 2022 field trial at OSU-NWREC.

Progress - Red Raspberry

We are actively breeding floricane-fruiting red raspberry selections for machine harvest and processing, and primocane-fruiting selections for handpick and fresh market. We support the broader PNW raspberry industry by providing an additional environment in OR for germplasm development and testing, teaming up with the Washington State University (WSU; Wendy Hoashi-Erhardt) and British Columbia (Michael Dossett) breeding programs and including a significant number of their advanced selections in our annual machine harvest trials at OSU-NWREC. Our efforts help to identify machine harvestable selections with high yield and fruit quality in multiple environments, and we generate new crosses using these selections that are in turn screened in WA for cold hardiness (Lynden, WA) and for root rot tolerance (Puyallup, WA). With regard to fresh market varieties, we are waiting for approval to patent and release the primocane-fruiting selection ORUS 4716-1, which has shown excellent yields and fruit quality.

Cultivar Releases

Pending Patent Approval

• ORUS 4716-1 – A primocane-fruiting selection with good firmness and flavor. The fruit can be picked at a range of colors from light pink to full red and still have sweetness and a good flavor. The season starts at about the same time as 'Heritage' but it peaks and finishes about 7d later than 'Heritage'.

Nursery/Propagation List

In addition to any above current/future variety releases, the following have been/are being propagated for grower trials:

Floricane (processing):

- (NEW) ORUS 4715-2 Best machine harvested fruit quality of OR selections in 2019 trial with easy release, best ability of any OR selection to hang and recover after high temperature stress.
- (NEW) ORUS 4974-1 Machine harvested well at higher beater speed, fruit have nice color, gloss and shape, firm with low leakage, sweet/tangy flavor, nice canopy with laterals that remain upright under fruit load.
- (NEW) ORUS 5106-1 While not as productive as 'Wakefield', has shown machine harvestable quality and yield on par with 'Meeker' in both OR and northern WA trials, with good firmness and better flavor than 'Meeker'. Contains 1/8 *R. leucodermis* genetics.
- **ORUS 4371-4** Very good machine harvested yield in both OR and northern WA. Good winter tolerance. High quality fruit.

- **ORUS 4600-1** Very good machine harvested yield in OR.
- ORUS 4373-1 Will be removed after 2021.
- ORUS 4462-2 Will be removed after 2021.
- ORUS 4600-3 Will be removed after 2021.
- ORUS 4607-2 Will be removed after 2021.

Primocane (fresh):

- (NEW) ORUS 5209-1 Plant has sturdy/erect canes, yield is competitive with 'Polka' and 'Kokanee', relatively large fruit with few defects, firm when picked light, good flavor/aroma.
- (NEW) ORUS 5248-1 Beautiful large glossy fruit with easily best flavor and strongest aroma of any primocane selection in trial, firmness is acceptable but not elite.
- ORUS 4487-1 Will be removed after 2021.
- ORUS 4725-1 Will be removed after 2021.

Other:

• **ORUS 4089-2** – An intermediate type with weak-PF habit. Fruit are an attractive orange color and looked good in OR and northern WA. Bright firm and attractive as PF type.

Grower Trials – Northern Washington (Enfield Farms)

Since 2001, we have actively trialed OR red raspberry selections at Enfield Farms (Lynden, WA), which sits on the Canadian border, to evaluate winter hardiness and machine harvestability in a commercial setting. Most but not all selections have been machine harvestable.

- **ORUS 5106-1** produced first-year yields similar to 'Meeker' with small, firm fruit that machine harvested well
- **ORUS 4089-2** produced attractive orange primocane fruit that were too soft for machine harvest

Grower Trials – Oregon (OSU-NWREC)

2018 Floricane Red Raspberry Trials (Table Ry-FL 1)

- WSU 2376 (REP) and WSU 2348 (REP) were top performing WA selections, yielding significantly higher than 'Meeker' and similar to or higher than 'Wakefield'. WSU 2348 was slightly less productive, but had consistent high fruit quality across plots, bright red and firm with few stems/rough.
- **ORUS 4961-1 (REP)** ('Cascade Harvest' x 'Chemainus') was top performing OR selection, outyielding 'Wakefield' in 2020. Good machine harvest fruit quality and excellent flavor/aroma. Main concerns are susceptible to winter injury in northern WA and firmness.

2019 Floricane Red Raspberry Trials (Table Ry-FL 2)

- Top performing WA selections:
 - WSU 2516 (REP) had similar yield to other top WA selections but stood out for showing much better plant health and fruit quality in a very hot 2021 season, with good machine harvest quality, fruit are a bright glossy color with good flavor. Firmness could be better.
 - WSU 2605 (REP) had very early/concentrated ripening, fruit ripened dark with okay quality
- Top performing OR selections:

- **ORUS 4715-2 (REP)** showed very good fruit release, nice glossy ruby color, had best machine harvest fruit quality of any OR selection under high temperatures.
- **ORUS 4974-1 (REP)** machine harvested well with slightly higher beater speed, fruit looked great on belt with good color, firmness, consistency.
- ORUS 5106-1 (REP) yielded as well as Meeker with better flavor, has firm fruit that machine harvested well in both OR and northern WA trials. Contains 1/8 *R. leucodermis* genetics.
- 'AAC Eden' (OBS) from Andrew Jamieson's breeding program showed excellent yields of fruit with surprisingly good firmness and machine harvest quality for their large size. Berries have a light-colored frosty appearance.

2018 Primocane Red Raspberry Trials (Table Ry-PR 1)

- **'Polka' (REP)** has been a consistent performer; a very early ripening cultivar that continues producing well into the primocane mid-season. Fruit are dark but glossy and attractive, with good firmness and decent but not excellent flavor. Replacing 'Heritage' and 'Vintage' as yield standard.
- **ORUS 4487-1 (REP)** is early (10d < 'Heritage') though not as early as 'Polka' and yields well though not as well as 'Polka'. Very nice appearance and quality, firm, good aroma, concern is fruit may be small for fresh market.

2019 Primocane Red Raspberry Trials (Table Ry-PR 2)

- ORUS 4716-1 (REP) has shown great performance over multiple trial-years with competitive yields, excellent fruit quality, strong/healthy plants, and fruit can be picked at a range of color stages with good flavor. Pending approval for release.
- **ORUS 5209-1 (REP)** showed excellent yields last 2 years surpassing 'Polka' and 'Kokanee', sturdy erect canes, large semi-conical and uniform w/ coherent drupelets, low rough/UV, firm when picked light, intense flavor, and tremendous aroma.
- **ORUS 5248-3 (OBS)** produces high yields of exceptionally large berries that are somewhat dark but with excellent firmness and quality, would consider for release but flavor is "wild" and likely not suitable for fresh market.

2020 Primocane Red Raspberry Trials (Table Ry-PR 3)

• ORUS 4716-1 (REP) and 'Polka' (REP) continue showing some of the best and most consistent yields and fruit quality across primocane raspberry trials. Will wait for second trial year to report on quality of new advanced selections.

By the Numbers: Crosses, Seedlings & Selections

In 2021:

- We attempted 53 red raspberry crosses, with 36 floricane-fruiting, and 17 primocane-fruiting families.
- We did not plant a seedling field; 2020 crosses held for the hire of a new caneberry breeder.
- We made 54 new red raspberry selections from the 2019 seedling population to be planted in the 2022 field trial at OSU-NWREC.

Progress - Black Raspberry

Though a niche crop, we are currently maintaining our black raspberry ("blackcap") breeding efforts, which include developing higher yielding and less thorny selections with improved eating quality and pairing with OSU Food Science to identify superior processing-oriented selections. Cooperating with the USDA-ARS NCGR lab (Nahla Bassil), we have incorporated marker-assisted selection for multiple aphid resistance genetic markers as a key component of this program in order to focus on selections with a reduced likelihood of harboring aphid-vectored viruses, a major problem for blackcaps growers in the northwest. Along with traditional black raspberry selections, we are attempting to develop "purple raspberry" hybrids incorporating both red and black raspberry genetics, as well as the wild species *Rubus coreanus*. While still in the early stages of development and evaluation, purple seedlings have demonstrated some favorable characteristics that may be help improve the performance of traditional blackcaps, including hybrid vigor, reduced thorniness, and better flavor.

Impact of Heat Dome on Black Raspberry

Statistical analysis of black raspberry data has been omitted from the 2021 caneberry breeding report. As a result of fruit damage and plant stress inflicted by high summer temperatures, including the 2021 "heat dome" which covered the Pacific Northwest in late June and early July, we were unable to gather meaningful data on fruit size, yield, or quality during the summer harvest season.

- Black raspberry appeared to be the **most susceptible to heat damage** of all caneberry crop types currently grown by the USDA-ARS-HCRU breeding program, with nearly 100% fruit loss in a majority of selections.
- In most cases the berries became fully desiccated on fruiting laterals, resulting in unmarketable fruit in the form of dried husks that would not release well when subjected to machine harvest.
- Exceptions with lower susceptibility were typically very late and partially escaped heat damage, or germplasm containing non-traditional black raspberry genetics, such as purple with different fruit morphology.

Cultivar Releases

Pending Patent Approval

Future Releases

• ORUS 3381-3 – A late season variety, as late as 'MacBlack' but with better fruit size and quality. Yield comparable to or slightly less than 'Munger' but starts ripening 12 d later. Targeted for fresh market.

Nursery/Propagation List

In addition to any above current/future variety releases, the following have been/are being propagated for grower trials:

• (NEW) ORUS 4310-1 – Similar or higher yielding than 'Munger' and vigorous, plant looks visibly healthier and more robust than others in field. Contains aphid resistance genetics. Fruit size on smaller side, dark purple.

- (NEW) ORUS 4833-1 Significantly higher yielding than 'Munger'. Machine harvests well with few stems, fruit are on larger side, firm and glossy. Very consistent across replicates.
- (NEW) ORUS 4395-1 Significantly higher yielding than 'Munger'.
- **ORUS 4499-1** Processing. Excellent yield and fruit quality. Machines well. Excellent root rot tolerance in WSU-Puyallup trials.
- **ORUS 3021-1** *Will be removed after 2021.*
- ORUS 3032-3 Will be removed after 2021.
- ORUS 3409-1 Will be removed after 2021.
- **ORUS** 4412-2 *Will be removed after 2021.*

By the Numbers: Crosses, Seedlings & Selections

In 2021:

- We attempted 18 black raspberry crosses, all floricane-fruiting.
- We did not plant a seedling field; 2020 crosses held for the hire of a new caneberry breeder.
- We made 17 new black raspberry selections from the 2019 seedling population to be planted in the 2022 field trial at OSU-NWREC.

	Berry Size (g)	Yield (to	ons∙a ⁻¹)	
<u>Annual Mean</u> ^a				
2019	6.27	7.31		
2020	6.78	5.06		
2021	4.95	3.80		
Genotype	2019-21	2020	2021	2019-21
<u>Replicated</u> ^z				
Columbia Star	6.88 b	5.76 a	5.48 a	6.26 a
*ORUS 4222-1	4.89 d	5.99 a	4.68 ab	6.16 ab
ORUS 4892-1	8.32 a	5.83 a	3.55 bc	6.12 ab
Black Diamond	5.78 c	5.25 a	2.47 c	5.18 b
ORUS 4425-1	4.13 e	2.46 b	2.82 c	3.24 c
<u>Nonreplicated</u>				
Columbia Giant	12.27	8.70	2.23	4.21
Marion	4.83	6.43	0.70	4.07
ORUS 4767-1	5.03	3.92	3.03	2.73
Hall's Beauty	3.90	3.57	2.79	2.33

Table Bk-TR 1. Fruit size and yield of trailing blackberry genotypes at OSU-NWREC for the 2017 trial planting, harvested from 2019-21. All are thornless except 'Marion'.

^a Annual means based on replicated plot samples. ^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

***ORUS 4222-1** pending patent approval for variety release

	Berry Size (g)	Yield (to	ons∙a⁻¹)	
<u>Annual Mean</u> ^a				
2020	7.49	6.67		
2021	5.18	3.58		
Genotype	2020-21	2020	2021	2020-21
<u>Replicated</u> ^z				
ORUS 4344-3	5.97 bc	8.08 a	4.16 a	6.12 a
Black Diamond	5.40 c	7.85 a	3.5 7 ab	5.71 ab
ORUS 4892-2	5.95 bc	6.69 b	3.66 ab	5.17 b
ORUS 4892-1	8.05 a	5.36 c	3.58 ab	4.47 c
Columbia Star	6.30 b	5.36 c	2.95 b	4.15 c
Nonreplicated				
Marion	4.95	5.81	5.19	5.50
Columbia Sunrise	6.25	3.50	2.16	2.83

Table Bk-TR 2. Fruit size and yield of trailing blackberry genotypes at OSU-NWREC for the 2018 trial planting, harvested from 2020-21. All are thornless except 'Marion'.

^a Annual means based on replicated plot samples. ^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

	Berry Size (g)	Yield (tons $\cdot a^{-1}$)
<u>Annual Mean</u> ^a		
2021	5.20	5.06
Genotype	2021	2021
<u>Replicated</u> ^z		
ORUS 5037-1	5.43 a	6.32 a
Black Diamond	5.30 a	4.87 b
Columbia Star	5.53 a	4.59 b
ORUS 4535-2	4.53 a	4.46 b
<u>Nonreplicated</u>		
*ORUS 4222-1	4.90	6.75
ORUS 5014-1	6.60	6.27
ORUS 5037-2	5.90	6.02
ORUS 5031-1	7.70	4.42
ORUS 5010-1	6.30	4.29
ORUS 5023-1	4.20	3.30
ORUS 5023-2	3.70	3.13
Marion	4.60	2.94
ORUS 5028-1	5.50	2.74
ORUS 5011-1	4.70	2.71
ORUS 4902-1	4.30	2.68
ORUS 5014-2	6.00	2.34
ORUS 5043-1	4.20	2.07
Kotata	4.20	1.72
ORUS 5019-1	4.20	1.48
ORUS 5008-1	5.30	1.43

Table Bk-TR 3. Fruit size and yield of trailing blackberry genotypes at OSU-NWREC for the 2019 trial planting, harvested from 2021. All are thornless except 'Marion' and 'Kotata'.

^a Annual means based on replicated plot samples.

^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

***ORUS 4222-1** pending patent approval for variety release

	Berry Size (g)	Yield ((tons·a ⁻¹)	
Genotype	2019-21	2020	2021	2019-21
Nonreplicated (2017)				
Chester Thornless	5.50	12.67	12.29	10.33
ORUS 4928-2	7.13	10.02	7.41	8.56
ORUS 4926-1	6.17	5.71	9.14	8.42
ORUS 4929-2	7.97	8.57	9.66	7.81
ORUS 4929-1	7.03	6.43	9.23	7.76
Triple Crown	7.83	5.96	7.31	6.64
Galaxy	7.20	4.73	7.19	6.17
Twilight	7.90	6.01	4.88	5.79
ORUS 2816-3	5.67	7.54	4.97	5.40
Eclipse	5.83	4.32	6.86	4.71
Nonreplicated (2018)				
Chester Thornless	5.25	8.09	10.39	9.24
Triple Crown	6.80	2.45	6.91	4.68
Black Jack	6.80	5.17	3.71	4.44
Nonreplicated (2019)				
Chester Thornless	4.50	-	10.88	10.88
ORUS 5057-1	5.70	-	9.86	9.86
Caddo	5.60	-	8.72	8.72
ORUS 5049-1	3.50	-	8.57	8.57
ORUS 5067-1	6.10	-	8.01	8.01
Triple Crown	6.40	-	7.63	7.63
ORUS 5058-2	7.20	-	7.37	7.37
ORUS 5056-2	4.50	-	7.15	7.15
ORUS 5058-1	5.80	-	5.87	5.87
ORUS 5050-1	3.20	-	5.86	5.86
ORUS 5056-1	3.60	-	5.27	5.27
ORUS 5065-2	2.80	-	5.01	5.01
ORUS 5065-1	3.90	-	4.61	4.61
ORUS 5066-1	5.60	-	3.91	3.91
ORUS 5045-1	3.50	-	2.88	2.88

Table Bk-SE 1. Fruit size and yield of semierect blackberry genotypes at OSU-NWREC for the 2017-19 trial plantings, harvested from 2019-21.

Table Bk-PR 1. Fruit size and yield of erect primocane blackberry genotypes at OSU-NWREC for the 2017 trial planting, harvested from 2019-21. *Low primocane yields in 2020 were the result of early harvest-season termination due to wildfire smoke.*

	Berry Size (g)	Yield	$(\text{tons} \cdot a^{-1})$	
Genotype	2019-21	2020	2021	2019-21
Nonreplicated (2017)				
*ORUS 4999-2	7.50	3.34	7.98	6.06
ORUS 4939-4	8.63	0.31	5.12	2.78
ORUS 4939-3	5.67	0.26	3.15	1.69
ORUS 4939-6	5.37	0.48	2.45	1.43

*ORUS 4999-2 pending patent approval for variety release

Table Bk-PR 2. Fruit size and yield of erect primocane blackberry genotypes at OSU-NWREC for the 2018 trial planting, harvested from 2020-21. *Low primocane yields in 2020 were the result of early harvest-season termination due to wildfire smoke.*

	Berry Size (g)	Yield (tons $\cdot a^{-1}$)		
<u>Annual Mean</u> ^a				
2020	8.13	1.22		
2021	7.50	5.41		
Genotype	2020-21	2020	2021	2020-21
<u>Replicated</u> ^z				
Prime-Ark 45	8.55 a	1.41 a	6.07 a	3.74 a
ORUS 5068-3	7.08 a	1.03 a	4.74 a	2.88 a
<u>Nonreplicated</u>				
ORUS 5069-1	6.45	0.91	5.12	3.02
ORUS 5068-5	9.35	2.16	2.23	2.19
ORUS 5068-1	7.80	0.64	2.38	1.51

^a Annual means based on replicated plot samples.

^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

	Berry Size (g)	Yield (tons $\cdot a^{-1}$)
<u>Annual Mean</u> ^a		
2021	7.40	5.99
Genotype	2021	2021
<u>Replicated</u> ^z		
*ORUS 4999-2	6.60 a	7.23 a
ORUS 5174-2	7.67 a	5.70 a
Prime-Ark 45	7.93 a	5.03 a
<u>Nonreplicated</u>		
ORUS 5174-1	7.60	2.15
ORUS 5173-4	8.70	1.62
ORUS 5174-3	6.10	1.47
ORUS 5175-1	5.30	0.63

Table Bk-PR 3. Fruit size and yield of erect primocane blackberry genotypes at OSU-NWREC for the 2019 trial planting, harvested from 2021.

^a Annual means based on replicated plot samples. ^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

*ORUS 4999-2 pending patent approval for variety release

		Trial	Harvest Se	ason (% Ripe I	Date)
Genotype	Type ^y	Field	5%	50%	95%
ORUS 4425-1	TR	2017	15-Jun	22-Jun	29-Jun
Black Diamond	TR	2017	22-Jun	29-Jun	6-Jul
ORUS 4892-1	TR	2017	22-Jun	29-Jun	6-Jul
ORUS 4892-1	TR	2018	22-Jun	29-Jun	6-Jul
Columbia Sunrise	TR	2018	22-Jun	29-Jun	29-Jun
ORUS 5023-1	TR	2019	22-Jun	29-Jun	6-Jul
ORUS 5028-1	TR	2019	22-Jun	29-Jun	13-Jul
ORUS 5043-1	TR	2019	22-Jun	29-Jun	13-Jul
Columbia Star	TR	2017	22-Jun	6-Jul	13-Jul
Black Diamond	TR	2018	22-Jun	6-Jul	13-Jul
Columbia Star	TR	2018	22-Jun	6-Jul	13-Jul
Black Diamond	TR	2019	22-Jun	6-Jul	20-Jul
ORUS 5031-1	TR	2019	22-Jun	6-Jul	6-Jul
ORUS 5019-1	TR	2019	22-Jun	13-Jul	20-Jul
Marion	TR	2017	29-Jun	29-Jun	29-Jun
ORUS 4222-1	TR	2017	29-Jun	6-Jul	13-Jul
ORUS 4767-1	TR	2017	29-Jun	6-Jul	6-Jul
ORUS 4344-3	TR	2018	29-Jun	6-Jul	20-Jul
ORUS 4892-2	TR	2018	29-Jun	6-Jul	13-Jul
Marion	TR	2018	29-Jun	6-Jul	13-Jul
Columbia Star	TR	2019	29-Jun	6-Jul	13-Jul
Kotata	TR	2019	29-Jun	6-Jul	6-Jul
Marion	TR	2019	29-Jun	6-Jul	20-Jul
ORUS 4222-1	TR	2019	29-Jun	6-Jul	20-Jul
ORUS 5014-2	TR	2019	29-Jun	6-Jul	13-Jul
ORUS 4902-1	TR	2019	29-Jun	13-Jul	13-Jul
Hall's Beauty	TR	2017	6-Jul	6-Jul	13-Jul
ORUS 4535-2	TR	2019	6-Jul	6-Jul	20-Jul
ORUS 5010-1	TR	2019	6-Jul	6-Jul	13-Jul
ORUS 5011-1	TR	2019	6-Jul	6-Jul	20-Jul
ORUS 5023-2	TR	2019	6-Jul	6-Jul	20-Jul
ORUS 5037-1	TR	2019	6-Jul	13-Jul	20-Jul
ORUS 5014-1	TR	2019	6-Jul	13-Jul	20-Jul
ORUS 5037-2	TR	2019	6-Jul	13-Jul	20-Jul
ORUS 4273-2	SE	2018	13-Jul	13-Jul	20-Jul

Table Bk-Season. Ripening season of all blackberry genotypes harvested in the 2017-19 trial plantings at OSU-NWREC in 2021.

ORUS 5066-1	SE	2019	13-Jul	13-Jul	27-Jul
Columbia Giant	TR	2017	13-Jul	13-Jul	13-Jul
ORUS 5008-1	TR	2019	13-Jul	13-Jul	20-Jul
Eclipse	SE	2017	13-Jul	20-Jul	10-Aug
Galaxy	SE	2017	13-Jul	20-Jul	3-Aug
Black Jack	SE	2018	13-Jul	20-Jul	3-Aug
ORUS 4453-1	SE	2018	13-Jul	20-Jul	20-Jul
Caddo	SE	2019	13-Jul	20-Jul	10-Aug
ORUS 5049-1	SE	2019	13-Jul	20-Jul	17-Aug
ORUS 5056-2	SE	2019	13-Jul	20-Jul	3-Aug
ORUS 5057-1	SE	2019	13-Jul	27-Jul	17-Aug
ORUS 5067-1	SE	2019	13-Jul	27-Jul	10-Aug
ORUS 4926-1	SE	2017	20-Jul	20-Jul	3-Aug
ORUS 5050-1	SE	2019	20-Jul	20-Jul	10-Aug
ORUS 5056-1	SE	2019	20-Jul	20-Jul	10-Aug
ORUS 5058-1	SE	2019	20-Jul	20-Jul	3-Aug
ORUS 2816-3	SE	2017	20-Jul	27-Jul	10-Aug
ORUS 4370-2	SE	2017	20-Jul	27-Jul	10-Aug
ORUS 4928-2	SE	2017	20-Jul	27-Jul	10-Aug
ORUS 4929-1	SE	2017	20-Jul	27-Jul	17-Aug
Triple Crown	SE	2017	20-Jul	27-Jul	10-Aug
Twilight	SE	2017	20-Jul	27-Jul	10-Aug
Triple Crown	SE	2018	20-Jul	27-Jul	10-Aug
ORUS 5045-1	SE	2019	20-Jul	27-Jul	17-Aug
ORUS 5058-2	SE	2019	20-Jul	27-Jul	10-Aug
ORUS 5065-1	SE	2019	20-Jul	27-Jul	17-Aug
ORUS 5065-2	SE	2019	20-Jul	27-Jul	10-Aug
Triple Crown	SE	2019	20-Jul	3-Aug	10-Aug
Chester Thornless	SE	2017	20-Jul	10-Aug	31-Aug
Chester Thornless	SE	2018	20-Jul	10-Aug	31-Aug
Chester Thornless	SE	2019	20-Jul	10-Aug	24-Aug
ORUS 5173-1	PF	2019	20-Jul	10-Aug	7-Sep
ORUS 5174-1	PF	2019	20-Jul	17-Aug	7-Sep
ORUS 5173-4	PF	2019	20-Jul	24-Aug	7-Sep
ORUS 4929-2	SE	2017	27-Jul	3-Aug	24-Aug
ORUS 5068-5	PF	2018	27-Jul	17-Aug	7-Sep
ORUS 5068-1	PF	2018	27-Jul	24-Aug	21-Sep
ORUS 5068-3	PF	2018	27-Jul	31-Aug	14-Sep
ORUS 5174-3	PF	2019	27-Jul	31-Aug	14-Sep
ORUS 5174-2	PF	2019	27-Jul	7-Sep	21-Sep

ORUS 4939-6	PF	2017	3-Aug	31-Aug	21-Sep
ORUS 4939-3	PF	2017	3-Aug	7-Sep	21-Sep
ORUS 4939-4	PF	2017	3-Aug	7-Sep	14-Sep
Prime-Ark 45	PF	2018	3-Aug	7-Sep	21-Sep
ORUS 5069-1	PF	2018	10-Aug	31-Aug	21-Sep
ORUS 4999-2	PF	2019	10-Aug	7-Sep	21-Sep
Prime-Ark 45	PF	2019	10-Aug	7-Sep	21-Sep
ORUS 4999-2	PF	2017	17-Aug	31-Aug	21-Sep
ORUS 5175-1	PF	2019	24-Aug	7-Sep	14-Sep
ORUS 5068-4	PF	2018	31-Aug	31-Aug	31-Aug

^y TR=Trailing; SE=Semierect; PF=Primocane.

	Berry Size (g)	Yield (tons: a^{-1})			
Annual Mean ^a	2011 9 5120 (8)	11010 (101			
2020	2.93	3.89			
2021	1.97	1.52			
Genotype	2020-21	2020	2021	2020-21	
<u>Replicated</u> ^z					
ORUS 4961-1	3.02 a	5.60 a	1.67 ab	3.63 a	
WSU 2376	2.75 ab	5.52 a	1.74 ab	3.63 a	
Wakefield	2.12 bc	4.90 ab	2.28 a	3.59 a	
WSU 2348	2.60 abc	4.72 ab	1.27 ab	2.99 ab	
ORUS 4640-1	2.52 abc	4.05 bc	1.60 ab	2.82 ab	
Meeker	2.10 c	3.30 cd	1.82 ab	2.56 bc	
ORUS 4463-1	2.58 abc	2.30 d	1.22 ab	1.76 cd	
WSU 2385	2.40 abc	2.54 d	0.91 b	1.73 cd	
ORUS 4978-3	1.97 c	2.10 d	1.22 ab	1.66 d	
<u>Nonreplicated</u>					
ORUS 4641-3	2.90	5.48	6.62	6.05	
Wakehaven	2.65	7.88	3.78	5.83	
ORUS 4975-1	2.90	2.99	7.69	5.34	
Cascade Harvest	3.30	6.19	3.14	4.66	
WSU 2234	2.25	6.11	3.12	4.62	
WSU 2278	2.40	5.89	2.84	4.36	
WSU 2268	2.55	5.66	3.02	4.34	
WSU 2510	2.40	6.15	2.32	4.24	
WSU 2372	2.90	6.68	1.68	4.18	
WSU 2506	2.90	5.53	2.79	4.16	
WSU 2298	2.45	5.21	2.92	4.06	
WSU 2505	2.60	5.57	2.25	3.91	
ORUS 4465-2	2.80	-	3.81	3.81	
WSU 2377	3.20	6.38	1.07	3.73	
WSU 2432	2.70	4.56	2.51	3.53	
WSU 2511	2.55	5.39	1.23	3.31	
WSU 2437	2.40	4.18	2.42	3.30	
ORUS 4600-3	1.70	4.43	1.91	3.17	

Table Ry-FL 1. Fruit size and yield of floricane red raspberry genotypes at OSU-NWREC for the 2018 trial planting, harvested from 2020-21. Yield measurements are based on machine picking using a Littau Harvester.

WSU 2357	2.50	4.76	1.41	3.08
ORUS 4961-3	2.85	3.90	1.74	2.82
ORUS 4972-1	2.00	3.79	1.28	2.54
ORUS 4974-1	2.30	3.91	1.15	2.53
WSU 2442	2.05	3.44	1.58	2.51
ORUS 4965-1	2.75	2.69	2.30	2.50
ORUS 4978-2	3.15	3.36	1.47	2.41
ORUS 4971-3	3.40	2.57	2.17	2.37
ORUS 4971-2	3.05	2.76	1.66	2.21
ORUS 4971-1	3.15	2.48	1.71	2.09
ORUS 4978-1	2.65	2.63	1.33	1.98
ORUS 4961-5	2.90	2.33	1.29	1.81
ORUS 4089-2	3.20	-	0.70	0.70

^a Annual means based on replicated plot samples. ^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

	Berry Size (g)	Yield (tons·a ⁻¹)
<u>Annual Mean</u> ^a		
2021	2.89	2.94
Genotype	2021	2021
<u>Replicated</u> ²		
ORUS 4974-1	3.00 ab	3.93 a
ORUS 4715-2	3.20 a	3.78 ab
*WSU 2605	2.97 ab	3.18 abc
WSU 2481	3.20 a	3.12 abc
WSU 2516	3.20 a	3.06 abc
ORUS 5104-2	2.90 ab	2.72 bc
ORUS 5106-1	2.23 c	2.68 bc
ORUS 4965-3	2.77 ab	2.54 c
Meeker	2.57 bc	2.35 c
WSU 2277	2.83 ab	2.04 c
<u>Nonreplicated</u>		
AAC Eden	4.6	4.81
ORUS 5106-3	1.9	3.26
ORUS 5105-1	2.0	3.25
ORUS 5107-1	1.6	3.01
ORUS 5102-2	2.2	2.86
ORUS 5099-1	2.9	2.62
ORUS 5108-3	2.7	2.53
ORUS 5106-2	1.8	2.51
ORUS 4843-1	3.9	2.48
WSU 2088	2.5	2.43
ORUS 5105-2	1.4	2.13
ORUS 5094-1	2.2	2.09
ORUS 4845-3	2.5	2.05
ORUS 5104-4	2.0	2.00
ORUS 5094-2	2.5	1.99
ORUS 4845-2	2.2	1.95
ORUS 5100-1	2.2	1.08

Table Ry-FL 2. Fruit size and yield of floricane red raspberry genotypes at OSU-NWREC for the 2019 trial planting, harvested from 2020-21. Yield measurements are based on machine picking using a Littau Harvester.

^a Annual means based on replicated plot samples.

^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

*WSU 2605 was hand-picked due to very early season ripening

	Berry Size (g)	Yield (tons $\cdot a^{-1}$)		
<u>Annual Mean</u> ^a				
2019	3.38	4.56		
2020	2.90	3.82		
2021	2.47	3.39		
Genotype	2019-21	2020	2021	2019-21
<u>Replicated</u> ^z				
Polka	3.28 a	4.63 a	3.93 a	4.41 a
ORUS 4487-1	2.56 b	3.01 a	2.84 a	3.43 b
<u>Nonreplicated</u>				
ORUS 5114-1	3.63	2.02	2.79	2.98
ORUS 4858-1	3.07	2.66	0.65	2.67
ORUS 5118-1	2.80	1.96	2.56	2.41
ORUS 5243-3	3.27	0.72	1.60	2.10
ORUS 5243-2	3.40	0.78	3.13	1.90
ORUS 4291-1	3.13	1.33	1.79	1.44
ORUS 5243-1	4.37	1.75	0.18	1.24
ORUS 5114-2	2.57	0.86	0.15	1.17
ORUS 5109-2	3.40	0.81	0.28	1.05
Vintage	2.27	0.35	0.51	0.72

Table Ry-PR 1. Fruit size and yield of primocane red raspberry genotypes at OSU-NWREC for the 2018 trial planting, harvested from 2019-21.

^a Annual means based on replicated plot samples. ^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

	Berry Size (g)	Yield (tons \cdot a ⁻¹)		
<u>Annual Mean</u> ^a				
2020	3.12	1.59		
2021	2.46	1.72		
Genotype	2020-21	2020	2021	2020-21
<u>Replicated</u> ^z				
ORUS 5209-1	3.12 a	2.51 a	2.09 a	2.30 a
ORUS 5250-1	3.08 a	1.91 b	1.83 a	1.87 b
ORUS 5248-1	3.22 a	1.01 c	2.17 a	1.59 bc
Kokanee	2.18 b	1.38 c	1.70 ab	1.54 c
ORUS 4725-1	2.35 b	1.17 c	0.80 c	0.99 d
ORUS 4858-2	-	-	1.19 bc	-
<u>Nonreplicated</u>				
ORUS 5248-3	4.35	2.54	3.02	2.78
*ORUS 4716-1	2.65	1.19	3.01	2.10
Polka	2.30	1.97	1.82	1.89
ORUS 5211-1	2.65	1.59	2.15	1.87
ORUS 5209-2	2.10	1.48	1.39	1.44
ORUS 5220-1	1.85	0.79	1.84	1.32
ORUS 5227-3	3.15	0.97	1.26	1.11
ORUS 5218-1	3.15	1.12	1.10	1.11
ORUS 5227-2	4.10	0.58	1.35	0.96
ORUS 5248-2	2.95	0.53	1.25	0.89

Table Ry-PR 2. Fruit size and yield of primocane red raspberry genotypes at OSU-NWREC for the 2019 trial planting, harvested from 2020-21.

^a Annual means based on replicated plot samples. ^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

*ORUS 4716-1 pending patent approval for variety release

	Berry Size (g)	Yield (tons $\cdot a^{-1}$)
<u>Annual Mean</u> ^a		
2021	1.57	1.53
Genotype	2021	2021
<u>Replicated</u> ^z		
*ORUS 4716-1	2.03 a	2.27 a
Heritage	1.10 b	0.78 b
<u>Nonreplicated</u>		
ORUS 5345-1	1.80	2.31
Polka	2.20	2.05
ORUS 5467-2	1.90	1.82
ORUS 4487-1	1.60	1.76
ORUS 5347-1	3.00	1.57
ORUS 5465-1	2.50	1.43
ORUS 5201-2	1.80	1.27
ORUS 5332-2	2.00	1.21
ORUS 5332-1	1.70	1.19
Addison	1.30	1.18
ORUS 5465-2	2.60	1.04
ORUS 5345-2	1.20	0.51

Table Ry-PR 3. Fruit size and yield of primocane red raspberry genotypes at OSU-NWREC for the 2020 trial planting, harvested from 2021.

^a Annual means based on replicated plot samples. ^z Groups determined by t-Test (LSD) of replicated plot means, $p \le 0.05$.

*ORUS 4716-1 pending patent approval for variety release

		Trial	Harvest Season (% Ripe Date)			
Genotype	Туре ^у	Field	5%	50%	95%	
WSU 2605	FF	2019	8-Jun	22-Jun	9-Jul	
ORUS 4961-5	FF	2018	9-Jun	9-Jul	13-Jul	
ORUS 4843-1	FF	2019	15-Jun	22-Jun	13-Jul	
WSU 2298	FF	2018	15-Jun	25-Jun	13-Jul	
WSU 2505	FF	2018	15-Jun	25-Jun	13-Jul	
ORUS 5104-2	FF	2019	15-Jun	25-Jun	13-Jul	
WSU 2481	FF	2019	15-Jun	25-Jun	13-Jul	
AAC Eden	FF	2019	15-Jun	25-Jun	13-Jul	
ORUS 5099-1	FF	2019	15-Jun	25-Jun	13-Jul	
WSU 2516	FF	2019	15-Jun	29-Jun	13-Jul	
ORUS 4961-1	FF	2018	22-Jun	25-Jun	13-Jul	
ORUS 4641-3	FF	2018	22-Jun	25-Jun	13-Jul	
WSU 2506	FF	2018	22-Jun	25-Jun	13-Jul	
ORUS 4715-2	FF	2019	22-Jun	25-Jun	13-Jul	
ORUS 5106-3	FF	2019	22-Jun	25-Jun	13-Jul	
Meeker	FF	2018	22-Jun	29-Jun	13-Jul	
Cascade Harvest	FF	2018	22-Jun	29-Jun	13-Jul	
ORUS 4465-2	FF	2018	22-Jun	29-Jun	13-Jul	
ORUS 4974-1	FF	2018	22-Jun	29-Jun	13-Jul	
Wakehaven	FF	2018	22-Jun	29-Jun	13-Jul	
WSU 2268	FF	2018	22-Jun	29-Jun	13-Jul	
WSU 2377	FF	2018	22-Jun	29-Jun	13-Jul	
WSU 2437	FF	2018	22-Jun	29-Jun	13-Jul	
ORUS 4965-3	FF	2019	22-Jun	29-Jun	13-Jul	
ORUS 4974-1	FF	2019	22-Jun	29-Jun	13-Jul	
ORUS 5106-1	FF	2019	22-Jun	29-Jun	13-Jul	
WSU 2277	FF	2019	22-Jun	29-Jun	13-Jul	
ORUS 5100-1	FF	2019	22-Jun	29-Jun	13-Jul	
ORUS 5105-1	FF	2019	22-Jun	29-Jun	13-Jul	
WSU 2088	FF	2019	22-Jun	29-Jun	13-Jul	
Meeker	FF	2019	22-Jun	6-Jul	13-Jul	
ORUS 5106-2	FF	2019	22-Jun	9-Jul	1-Jul	
ORUS 4640-1	FF	2018	22-Jun	9-Jul	13-Jul	
WSU 2348	FF	2018	22-Jun	9-Jul	13-Jul	
WSU 2376	FF	2018	22-Jun	9-Jul	13-Jul	

Table Ry-Season. Ripening season of all red raspberry genotypes harvested in the 2018-20 trial plantings at OSU-NWREC in 2021.

ORUS 4600-3	FF	2018	22-Jun	9-Jul	13-Jul
ORUS 4961-3	FF	2018	22-Jun	9-Jul	13-Jul
ORUS 4965-1	FF	2018	22-Jun	9-Jul	13-Jul
ORUS 4971-2	FF	2018	22-Jun	9-Jul	13-Jul
WSU 2234	FF	2018	22-Jun	9-Jul	13-Jul
WSU 2357	FF	2018	22-Jun	9-Jul	13-Jul
WSU 2432	FF	2018	22-Jun	9-Jul	13-Jul
WSU 2442	FF	2018	22-Jun	9-Jul	13-Jul
WSU 2510	FF	2018	22-Jun	9-Jul	13-Jul
ORUS 4845-2	FF	2019	22-Jun	9-Jul	13-Jul
ORUS 5094-1	FF	2019	22-Jun	9-Jul	13-Jul
ORUS 5094-2	FF	2019	22-Jun	9-Jul	13-Jul
ORUS 5102-2	FF	2019	22-Jun	9-Jul	13-Jul
ORUS 5104-4	FF	2019	22-Jun	9-Jul	13-Jul
WSU 2385	FF	2018	22-Jun	9-Jul	20-Jul
Wakefield	FF	2018	25-Jun	9-Jun	13-Jul
ORUS 5108-3	FF	2019	25-Jun	9-Jun	20-Jul
ORUS 4089-2	FF	2018	25-Jun	25-Jun	25-Jun
ORUS 4965-3	FF	2018	25-Jun	25-Jun	25-Jun
WSU 2511	FF	2018	25-Jun	25-Jun	13-Jul
ORUS 5107-1	FF	2019	25-Jun	6-Jul	13-Jul
ORUS 4978-3	FF	2018	25-Jun	9-Jul	13-Jul
ORUS 4971-1	FF	2018	25-Jun	9-Jul	13-Jul
ORUS 4971-3	FF	2018	25-Jun	9-Jul	13-Jul
ORUS 4972-1	FF	2018	25-Jun	9-Jul	13-Jul
ORUS 4975-1	FF	2018	25-Jun	9-Jul	13-Jul
ORUS 4978-1	FF	2018	25-Jun	9-Jul	13-Jul
ORUS 4978-2	FF	2018	25-Jun	9-Jul	13-Jul
WSU 2278	FF	2018	25-Jun	9-Jul	13-Jul
WSU 2372	FF	2018	25-Jun	9-Jul	13-Jul
ORUS 4845-3	FF	2019	25-Jun	9-Jul	13-Jul
ORUS 5105-2	FF	2019	25-Jun	9-Jul	13-Jul
ORUS 4463-1	FF	2018	29-Jun	13-Jul	13-Jul
Polka	PF	2018	20-Jul	3-Aug	31-Aug
ORUS 5250-1	PF	2019	20-Jul	3-Aug	31-Aug
ORUS 5218-1	PF	2019	20-Jul	3-Aug	31-Aug
Polka	PF	2019	20-Jul	3-Aug	31-Aug
ORUS 4725-1	PF	2019	20-Jul	10-Aug	31-Aug
ORUS 5211-1	PF	2019	20-Jul	10-Aug	7-Sep
ORUS 4291-1	PF	2018	20-Jul	17-Aug	7-Sep

ORUS 4487-1	PF	2018	20-Jul	17-Aug	14-Sep
Polka	PF	2020	20-Jul	24-Aug	31-Aug
ORUS 5109-2	PF	2018	27-Jul	3-Aug	10-Aug
ORUS 5248-1	PF	2019	27-Jul	10-Aug	31-Aug
ORUS 5118-1	PF	2018	27-Jul	17-Aug	7-Sep
ORUS 5465-1	PF	2020	27-Jul	17-Aug	7-Sep
ORUS 4858-1	PF	2018	3-Aug	10-Aug	10-Aug
ORUS 5114-2	PF	2018	3-Aug	10-Aug	10-Aug
ORUS 5243-1	PF	2018	3-Aug	10-Aug	10-Aug
ORUS 5201-2	PF	2020	3-Aug	17-Aug	7-Sep
ORUS 5345-2	PF	2020	3-Aug	24-Aug	31-Aug
ORUS 5114-1	PF	2018	3-Aug	24-Aug	7-Sep
ORUS 5209-2	PF	2019	3-Aug	24-Aug	7-Sep
ORUS 4487-1	PF	2020	3-Aug	24-Aug	7-Sep
ORUS 5332-1	PF	2020	3-Aug	24-Aug	7-Sep
ORUS 5467-2	PF	2020	3-Aug	24-Aug	7-Sep
Kokanee	PF	2019	3-Aug	24-Aug	14-Sep
ORUS 5209-1	PF	2019	3-Aug	24-Aug	14-Sep
ORUS 5220-1	PF	2019	3-Aug	24-Aug	14-Sep
ORUS 5227-2	PF	2019	3-Aug	24-Aug	14-Sep
ORUS 5248-2	PF	2019	3-Aug	24-Aug	14-Sep
ORUS 5345-1	PF	2020	3-Aug	24-Aug	14-Sep
ORUS 5465-2	PF	2020	3-Aug	31-Aug	14-Sep
ORUS 5227-3	PF	2019	3-Aug	31-Aug	21-Sep
ORUS 5243-3	PF	2018	3-Aug	7-Sep	21-Sep
ORUS 4858-2	PF	2019	10-Aug	24-Aug	7-Sep
ORUS 5243-2	PF	2018	10-Aug	24-Aug	21-Sep
ORUS 4716-1	PF	2019	17-Aug	24-Aug	14-Sep
ORUS 5248-3	PF	2019	17-Aug	24-Aug	14-Sep
ORUS 4716-1	PF	2020	17-Aug	31-Aug	21-Sep
Addison	PF	2020	24-Aug	31-Aug	7-Sep
ORUS 5347-1	PF	2020	24-Aug	31-Aug	14-Sep
ORUS 5332-2	PF	2020	24-Aug	7-Sep	21-Sep
Heritage	PF	2020	31-Aug	14-Sep	21-Sep
ORUS 5344-1	PF	2020	21-Sep	21-Sep	21-Sep

^y FF=Floricane; PF=Primocane.

RESEARCH REPORT TO THE OREGON RASPBERRY AND BLACKBERRY COMMISSION AND THE AGRICULTURAL RESEARCH FOUNDATION 2021-2022

Title:	Evaluation of processing quality of advanced caneberry breeding selections
Investigator:	Zak Wiegand, Faculty Research Assistant Food Science & Technology, OSU
Cooperators:	Dr. Michael Hardigan, USDA-ARS HCRU, Corvallis Dr. Wendy Hoashi-Erhardt, Washington State University, Puyallup
Objectives:	 Evaluate advanced caneberry breeding selections from NWREC and USDA for objective attributes related to processing potential Process samples of advanced selections, selected field crosses, and standard varieties for display to and evaluation by growers, breeders, and processors
Project Duration:	July 1, 2021, through June 30, 2022
Funding Requested	for 2021-2022: \$ 9793

Results:

Despite the continuing challenges that the COVID-19 pandemic has posed and the heat events that severely impacting caneberry crops this season, caneberry cultivars and ORUS breeding selections from the North Willamette Research and Extension Center's Caneberry Test Blocks were sent to the OSU Department of Food Science & Technology Pilot Plant for processing and analysis from June 15th through September 14th, 2021.

Processing:

Caneberry cultivars and selections from plots at the North Willamette Research and Extension Center During of the following genotypes were sent to OSU Department of Food Science & Technology Pilot Plant for processing and analysis:

Blackberries

- 15 commercial cultivars
- 55 ORUS selections

Red Raspberry

- 9 commercial cultivars
- 51 ORUS selections
- 14 WSU selections

Black Raspberry

- 3 commercial cultivars
- 37 ORUS Selections

Processing methods were adjusted for the pandemic to ensure the safety of student workers and myself while making sure to continue this important project. While there were challenges due to the pandemic, processes were updated to improve the quality, food safety, and alignment with commercial IQF fruit production methods.

Evaluations:

The pandemic has continued to prove challenging to perform fruit display and evaluations as most events have been canceled, restricted, or remained virtual. A system for sample-from-home berry evaluations and online surveys has been developed and will be executed in the first quarter of 2022 to allow stakeholders to provide feedback on advanced breeding selections.

Chemistry:

Basic chemical analysis was performed for samples collected during the 2021 processing season and the results for those samples are attached in Tables 1-6. (°brix, pH, and TA)

Fable 1. Weighted chemistry	analysis for 2021 l	blackberry advanced	selections and	commercial	cultivars
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Selection/Cultivar	Planting Year	Titratable Acidity ^a	Soluble Solids ^b	pН	
Black Diamond	2019		1.17	12.16	3.62
	2018		1.25	13.16	3.52
Black Jack	2018		1.06	14.22	3.49
Cado	2019		0.89	12.88	3.83
Chester Thornless	2017		1.08	13.56	3.46
	2018		1.34	12.42	3.30
	2019		1.35	12.21	3.65
Columbia Giant	2017		1.32	13.03	3.35
Columbia Star	2017		1.56	17.40	3.55
	2018		1.29	14.35	3.68
	2019		1.40	14.02	3.76
Columbia Sunrise	2018		0.97	13.45	3.59
Eclipse	2017		1.02	13.01	3.47
Galaxy	2017		0.94	12.25	3.43
Halls Beauty	2017		1.39	13.63	3.46
Kotata	2019		1.35	12.66	3.38
Marion	2018		1.20	12.05	3.74
	2019		1.36	12.28	3.54
Triple Crown	2019		1.03	15.29	3.60
	2018		1.09	15.15	3.71
	2017		1.19	14.84	3.38
Twilight	2017		0.98	15.64	3.64
ORUS 2816-3	2017		1.01	12.52	3.55
ORUS 4023-4	2017		1.24	18.45	3.76
ORUS 4222-1	2017		0.95	13.72	3.66
	2019		1.10	12.06	3.72
ORUS 4273-2	2018		0.90	13.36	3.66
ORUS 4344-3	2018		0.89	13.96	3.91
ORUS 4370-2	2017		1.05	16.24	3.76
ORUS 4425-1	2017		1.29	11.48	3.64
ORUS 4453-1	2018		1.13	13.59	3.53
ORUS 4535-2	2019		1.70	14.03	3.32
ORUS 4767-1	2017		1.18	13.41	3.58
ORUS 4892-1	2018		1.08	15.83	3.88
	2017		1.32	13.64	3.49
ORUS 4892-2	2018		1.19	14.21	3.81
ORUS 4902-1	2019		0.79	18.01	4.07
ORUS 4926-1	2017		0.94	9.31	3.71
ORUS 4928-2	2017		0.96	11.83	3.59
ORUS 4929-1	2017		1.20	12.26	3.56
ORUS 4929-2	2017		1.38	12.23	3.20
ORUS 4939-4	2017		0.88	13.93	3.56
ORUS 4999-2	2019		0.80	14.34	3.58
ORUS 5010-1	2019		1.74	15.53	3.41

ORUS 5011-1	2019	1.08	12.60	3.67
ORUS 5014-1	2019	1.29	12.13	3.36
ORUS 5014-2	2019	1.21	13.77	3.40
ORUS 5023-1	2019	0.92	14.19	3.69
ORUS 5023-2	2019	1.10	15.32	3.80
ORUS 5031-1	2019	1.14	13.34	3.69
ORUS 5037-1	2019	1.06	13.16	3.71
ORUS 5037-2	2019	1.10	13.34	3.64
ORUS 5043-1	2019	1.37	14.40	3.52
ORUS 5045-1	2019	0.83	13.73	3.77
ORUS 5049-1	2019	0.86	11.60	3.68
ORUS 5050-1	2019	0.69	13.67	3.99
ORUS 5056-2	2019	1.34	11.67	3.30
ORUS 5057-1	2019	0.82	12.29	3.78
ORUS 5058-1	2019	1.11	13.28	3.57
ORUS 5065-1	2019	0.78	13.54	3.97
ORUS 5065-2	2019	0.68	13.03	4.02
ORUS 5066-1	2019	0.90	12.69	3.85
ORUS 5067-1	2019	1.09	14.27	3.63
ORUS 5068-3	2018	0.72	16.19	3.74
ORUS 5069-1	2018	0.68	15.48	3.66

Note: All reported values are weighted averages based on the number of harvests and samples tested.

^a g citric acid/100g fruit

Table 2. Chemistry analys	is for 2021 blackberr	y advanced selections and	d commercial cultivars	s by harvest dat
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Selection/Cultivar	Planting Year	Harvest Date	Titratable Acidity ^a	Soluble Solids ^b	рН
Black Diamond	2018	6/21/2021	1.40	12.56	3.51
		7/13/2021	1.14	13.60	3.53
	2019	7/6/2021	1.12	12.18	3.66
		7/13/2021	1.21	12.14	3.59
Black Jack	2018	7/13/2021	1.03	13.97	3.53
		7/20/2021	1.11	14.55	3.45
Cado	2019	7/13/2021	0.89	12.88	3.83
Chester Thornless	2017	7/27/2021	1.19	12.47	3.46
		8/3/2021	0.94	14.99	3.47
	2018	7/20/2021	1.36	11.86	3.18
		7/27/2021	1.32	12.74	3.38
	2019	7/27/2021	1.35	12.21	3.65
Columbia Giant	2017	7/13/2021	1.32	13.03	3.35
Columbia Star	2017	7/13/2021	1.56	17.40	3.55
	2018	7/6/2021	1.29	14.35	3.68
	2019	7/6/2021	1.40	14.02	3.76
Columbia Sunrise	2018	6/21/2021	0.97	13.45	3.59
Eclipse	2017	7/20/2021	1.03	12.87	3.44
		7/13/2021	1.00	13.33	3.54
Galaxy	2017	7/20/2021	0.94	12.01	3.43
		7/13/2021	0.95	12.81	3.45
Halls Beauty	2017	7/6/2021	1.39	13.63	3.46
Kotata	2019	7/6/2021	1.35	12.66	3.38
Marion	2018	7/13/2021	1.20	12.05	3.74
	2019	7/6/2021	1.36	12.28	3.54
Triple Crown	2017	7/20/2021	1.16	14.78	3.38
		7/27/2021	1.21	14.88	3.38
	2018	7/20/2021	1.07	15.04	3.53
		7/27/2021	1.10	15.21	3.81
	2019	7/20/2021	1.00	14.74	3.53
		7/27/2021	1.05	15.60	3.64
Twilight	2017	7/20/2021	0.98	14.91	3.49
		7/27/2021	0.99	16.73	3.87
ORUS 2816-3	2017	7/20/2021	1.01	12.52	3.55
ORUS 4023-4	2017	7/13/2021	1.24	18.45	3.76
ORUS 4222-1	2017	7/6/2021	0.92	13.54	3.58
		7/13/2021	0.99	13.94	3.75
	2019	7/6/2021	1.21	12.22	3.67
		7/13/2021	0.99	11.90	3.78
ORUS 4273-2	2018	7/13/2021	0.81	13.70	3.75
ORUS 4273-2		7/20/2021	1.02	12.87	3.53
ORUS 4344-3	2018	7/6/2021	0.90	12.89	4.04
ORUS 4344-3		7/13/2021	0.87	15.97	3.69
ORUS 4370-2	2017	7/27/2021	1.05	16.24	3.76
ORUS 4425-1	2017	6/21/2021	1.29	11.48	3.64

ORUS 4453-1	2018	7/13/2021	1.06	14.21	3.43
		7/20/2021	1.17	13.30	3.58
ORUS 4535-2	2019	7/6/2021	1.73	13.20	3.38
ORUS 4535-2		7/13/2021	1.66	15.06	3.25
ORUS 4767-1	2017	7/6/2021	1.18	13.41	3.58
ORUS 4892-1	2017	6/21/2021	1.32	13.64	3.49
	2018	6/21/2021	1.29	14.24	3.57
		7/6/2021	0.96	16.74	4.06
ORUS 4892-2	2018	7/6/2021	1.25	13.55	3.80
		7/13/2021	0.83	17.84	3.86
ORUS 4902-1	2019	7/13/2021	0.79	18.01	4.07
ORUS 4926-1	2017	7/20/2021	0.93	9.33	3.64
		7/27/2021	0.96	9.27	3.89
ORUS 4928-2	2017	7/20/2021	0.96	11.35	3.56
		7/27/2021	0.97	12.70	3.64
ORUS 4929-1	2017	7/20/2021	1.24	11.75	3.65
		7/27/2021	1.16	12.69	3.48
ORUS 4929-2	2017	7/27/2021	1.37	12.68	3.29
		8/3/2021	1.38	11.96	3.16
ORUS 4939-4	2017	9/7/2021	0.88	13.93	3.56
ORUS 4999-2	2019	8/31/2021	0.80	14.34	3.58
ORUS 5010-1	2019	7/6/2021	1.77	15.14	3.42
		7/13/2021	1.66	16.90	3.39
ORUS 5011-1	2019	7/6/2021	1.16	12.60	3.65
		7/13/2021	0.98	12.61	3.70
ORUS 5014-1	2019	7/6/2021	1.27	11.73	3.31
		7/13/2021	1.30	12.34	3.39
ORUS 5014-2	2019	7/6/2021	1.21	13.77	3.40
ORUS 5023-1	2019	6/21/2021	0.92	14.19	3.69
ORUS 5023-2	2019	7/6/2021	1.10	15.32	3.80
ORUS 5031-1	2019	6/29/2021	1.45	13.66	3.55
		7/6/2021	0.97	13.16	3.77
ORUS 5037-1	2019	7/13/2021	1.04	12.87	3.66
		7/6/2021	1.11	13.66	3.80
ORUS 5037-2	2019	6/21/2021	1.15	11.75	3.72
		7/6/2021	1.03	13.76	3.62
		7/13/2021	1.14	13.67	3.63
ORUS 5043-1	2019	6/21/2021	1.37	14.40	3.52
ORUS 5045-1	2019	7/20/2021	0.83	13.73	3.77
ORUS 5049-1	2019	7/13/2021	0.86	11.53	3.67
		7/20/2021	0.86	11.67	3.70
ORUS 5050-1	2019	7/20/2021	0.62	13.76	4.07
		7/27/2021	0.85	13.46	3.81
ORUS 5056-2	2019	7/13/2021	1.39	11.77	3.33
		7/20/2021	1.32	11.63	3.30
ORUS 5057-1	2019	7/20/2021	0.87	11.87	3.60
		7/27/2021	0.77	12.67	3.95

ORUS 5058-1	2019	7/20/2021	1.18	12.80	3.36	
		7/27/2021	0.99	14.14	3.95	
ORUS 5065-1	2019	7/20/2021	0.76	13.14	3.86	
		7/27/2021	0.80	14.16	4.15	
ORUS 5065-2	2019	7/20/2021	0.66	12.75	3.98	
		7/27/2021	0.71	13.47	4.09	
ORUS 5066-1	2019	7/13/2021	0.90	12.69	3.85	
ORUS 5067-1	2019	7/20/2021	1.02	14.14	3.43	
		7/27/2021	1.14	14.36	3.79	
ORUS 5068-3	2018	8/31/2021	0.72	16.19	3.74	
ORUS 5069-1	2018	8/31/2021	0.68	15.48	3.66	

Selection/Cultivar	Planting Year	Titratable Acidity ^a	Soluble Solids ^b	рН
Kokanee	2019	1.37	13.96	3.39
Meeker	2019	1.33	11.97	3.65
Polka	2018	1.39	12.46	3.68
ORUS 4487-1	2018	1.41	14.32	3.38
ORUS 4715-2	2019	1.48	10.58	3.38
ORUS 4716-1	2020	2.00	14.27	3.17
ORUS 4974-1	2019	1.72	13.31	3.48
ORUS 4978-3	2018	2.09	15.09	3.57
ORUS 5106-1	2019	2.36	14.58	3.39
WSU 2516	2019	1.13	12.81	3.62
WSU 2605	2019	1.67	9.95	3.55

Table 3. Weighted chemistry analysis for 2021 red raspberry advanced selections and commercial cultivars

Selection/Cultivar	Planting Year	Harvest Date	Titratable Acidity ^a	Soluble Solids ^b	рН
Kokanee	2019	8/24/2021	1.37	13.96	3.39
Meeker	2019	7/6/2021	1.33	11.97	3.65
Polka	2018	7/20/2021	1.27	11.94	3.73
	2018	7/27/2021	1.46	12.57	3.87
	2018	8/24/2021	1.43	12.86	3.44
ORUS 4487-1	2018	8/24/2021	1.41	14.32	3.38
ORUS 4715-2	2019	6/21/2021	1.58	10.40	3.37
	2019	7/6/2021	1.33	10.83	3.39
ORUS 4716-1	2020	8/31/2021	2.00	14.27	3.17
ORUS 4974-1	2019	7/6/2021	1.48	11.56	3.45
	2019	7/13/2021	1.94	14.95	3.52
ORUS 4978-3	2018	7/13/2021	2.09	15.09	3.57
ORUS 5106-1	2019	7/13/2021	2.36	14.58	3.39
WSU 2516	2019	7/6/2021	1.13	12.81	3.62
WSU 2605	2019	6/21/2021	1.67	9.95	3.55

Table 4. Chemistry analysis for 2021 red raspberry advanced selections and commercial cultivars by harvest date

Selection/Cultivar	Planting Year	Titratable Acidity ^a	Soluble Solids ^b	рН	
Munger	2019	1.15	14.15	3.85	
ORUS 3217-1	2019	0.94	13.23	4.01	
ORUS 3843-1	2018	1.24	18.41	3.77	
ORUS 4110-2	2018	1.17	15.77	3.74	
ORUS 4154-1	2019	1.21	14.13	3.80	
ORUS 4310-1	2018	1.35	14.54	3.65	
ORUS 4828-2	2019	1.05	15.60	3.98	
ORUS 4952-3	2019	1.12	15.88	3.92	
ORUS 5078-1	2018	1.34	14.39	3.63	
ORUS 5083-1	2018	0.79	15.20	3.95	
ORUS 5090-1	2019	1.14	14.32	4.13	
ORUS 5090-3	2019	1.25	15.82	4.08	
ORUS 5090-4	2019	1.46	12.20	3.65	
ORUS 5091-2	2019	1.15	14.22	4.28	
ORUS 5091-5	2019	1.25	14.18	4.06	
ORUS 5092-1	2019	1.19	13.60	3.80	
ORUS 5093-1	2019	1.05	16.17	4.04	
ORUS 5094-2	2019	1.20	15.68	3.89	
ORUS 5186-1	2019	1.05	16.68	3.99	
ORUS 5190-1	2019	1.02	14.81	4.07	

Selection/Cultivar	Planting Year	Harvest Date	Titratable Acidity ^a	Soluble Solids ^b	рН
Munger	2019	6/21/2021	1.15	14.15	3.85
ORUS 3217-1	2019	6/21/2021	0.94	13.23	4.01
ORUS 3843-1	2018	6/21/2021	1.24	18.41	3.77
ORUS 4110-2	2018	6/21/2021	1.17	15.77	3.74
ORUS 4154-1	2019	6/21/2021	1.21	14.13	3.80
ORUS 4310-1	2018	6/21/2021	1.35	14.54	3.65
ORUS 4828-2	2019	6/21/2021	1.05	15.60	3.98
ORUS 4952-3	2019	6/21/2021	1.12	15.88	3.92
ORUS 5078-1	2018	6/21/2021	1.34	14.39	3.63
ORUS 5083-1	2018	7/13/2021	0.79	15.20	3.95
ORUS 5090-1	2019	6/21/2021	1.14	14.32	4.13
ORUS 5090-3	2019	6/21/2021	1.25	15.82	4.08
ORUS 5090-4	2019	6/15/2021	1.45	10.09	3.50
		6/21/2021	1.46	14.18	3.79
ORUS 5091-2	2019	6/21/2021	1.15	14.22	4.28
ORUS 5091-5	2019	6/21/2021	1.25	14.18	4.06
ORUS 5092-1	2019	6/21/2021	1.19	13.60	3.80
ORUS 5093-1	2019	6/21/2021	1.05	16.17	4.04
ORUS 5094-2	2019	6/21/2021	1.20	15.68	3.89
ORUS 5186-1	2019	6/21/2021	1.05	16.68	3.99
ORUS 5190-1	2019	6/21/2021	1.02	14.81	4.07

Table 6. Chemistry analysis for 2021 black raspberry advanced selections and commercial cultivars by harvest date

^a g citric acid/100g fruit ^{b o}Brix



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Small Fruit Update Progress Report

As of November 2021

Objectives:

- Increase industry communication.
- > Increase grower knowledge of IPM strategies.
- > Accelerate the dissemination of pesticide information. such as label changes to growers.
- > Facilitate real time pest alerts to growers throughout the growing season.
- Inform industry personnel of upcoming meetings as well as other relevant commission news such as elections, seat vacancies and/or legislative activities.

Overview

The SFU, Small Fruit Update, is released via email weekly during the growing season and shifts to bimonthly during the winter months (October – February). Subscribers were reduced by four individuals with a total audience of **1,472 (1,428 in 2020) people. Sixty-five percent of subscribers are highly engaged**, reading each week.

Peerbolt Crop Management has been providing a weekly emailed Small Fruit Update (SFU) to an increasing number of growers, industry personnel, and researchers since February 2000. Seven years ago, the SFU was taken over by Northwest Berry Foundation. As several recipients regularly pass it on to others, we estimate the total number receiving the Update to be well over 1,500 people. Additionally, considering the movement of sharing this with social media platforms over the last couple years, readership has increased but just in a different format.

Of the subscribers:

- 213 are in BC, 575 in Oregon, 369 in Washington, and 315 located elsewhere
- 679 are growers, 543 are industry members, and 172 are public researchers
- Of growers who reported what they produce: 250 Blackberry, 560 Blueberry, 200 Strawberries, 290 Raspberry

While the newsletter primarily targets regional producers and processors, it is regularly forwarded to buyers to boost sales. Our readership count is artificially low, as we are unable to directly track readership outside subscription. In addition to email, NBF has been expanding the dissemination of the Small Fruit Update through various social media platforms. The demographics and way people receive the SFU is shifting so we are adjusting to that shift.

The following charts illustrate the profile of the Small Fruit Update recipients in our database as of the date of this report.

2020 Profile of the Small Fruit Update



We make every effort to provide you with accurate information. We don't mandate those who sign up for the SFU to give any information beyond their email address, name, address, and phone number. We also request that growers note what crops they grow. Sometimes they do, and sometimes they do not. This means that our annual demographic reports often change previous report's numbers. Also note that each year we lose a certain number of recipients. Some drop out because of a job change, but there are always a few dropped simply because their email address no longer works, and we are unable to rectify the situation after attempting to contact them. In the last couple years, we have made an effort to clean up the mailing list to better reflect actual active recipients.

Since the beginning of the year, there has been a subscriber decrease of 98 recipients in BC and an increase of 28 in Oregon and 34 in Washington. The remaining recipients are located throughout the U.S., Canada, and the rest of the world. That segment increased by 80 subscribers.



The "Growers" category decreased by 3 individual subscribers. The "Researchers" category includes anyone associated with USDA, ARS, a college, or university, as well as state or federal departments of agriculture, and others who work for public agencies. Over the past year, researchers receiving the Small Fruit Update increased by 12 individuals. The category "Industry" includes suppliers, newspaper reporters, propagators, processors, nurseries, fruit buyers, manufacturers, sales reps, and even bankers. This year the number of industry recipients decreased by 7 individual subscribers.



In general, the trend over the past 10 years is that strawberry, blackberry, and raspberry recipients have grown at near parallel rates. (Note: counts from 2020 in this segment were miscounted at time of 2020 reporting). The number of recipients identifying themselves as strawberry growers increased by 22, raspberry growers increased by 22, blackberry growers increased by 12, and blueberry growers increased by 36 since 2019.



Our signup form encourages those wanting the Update to give us demographic information. The crop data presented above reflects the fact that some growers do not indicate what crop they grow, and many growers are harvesting more than one small fruit.

As noted at the start of this report the Small Fruit Update continues to expand its recipient list and the quality and quantity of the information provided. In 2004 our list comprised the addresses of 186 individuals. We have added 1,286 addresses since that time.

Social Media Report

Facebook

The NW Berry Foundation Facebook page was created in 2019 to direct people back to the NW Berry Website. Individuals using the Facebook platform searched and found our page using the terms "NW Berry Foundation" and "berry u-picks." In July of 2019, we had a small audience of **90 followers**. In 2020, our followers increased to 151. As of November 2021, our **followers have increased to 209**. The majority of our current Facebook followers are *vegetable farmers, berry growers, and regional food service organizations*. Beginning July 2019, the SFU was unofficially released via Facebook. The SFU newsletters shared on Facebook receive up to 127 impressions* and 12 engagements**. *Impressions: the number of times a post is displayed. **Engagement: the number of likes, shares and comments. This social media platform has been successful at direct newsletter clicks and directing readers to the SFU Newsletter webpage.

Twitter

Beginning in September 2019, a NW Berry Foundation Twitter account (#NWBerryFdn) was established to provide an additional outlet for quickly releasing berry news and the Small Fruit Update. In two weeks of operation, we gained 170 twitter followers. As of November 2021, our followers have **increased to 299 followers, up by 47 followers from one year ago**. Multiple news and event postings have been retweeted including conference announcements, berry research articles, and ag policy news. The quality of followers is high with retweets from the Packer and WSU/OSU professors and likes primarily from graduate students and industry researchers. Monthly impressions* range from 439 -2,820 depending on post content. *Impressions is the number of times posts have been seen. High impressions occurred at the beginning of the growing season (Feb. and March) as well as at the end of the season in October. This social media platform has been successful at gaining industry members and researcher followers.

Instagram

The Northwest Berry Foundation established an Instagram account (@northwestberryfoundation) in September 2019. Starting in January 2020, Instagram was used as an avenue for sharing the Small Fruit Update. Relevant SFU photos were shared and linked to our SFU newsletter webpage (i.e. Link in Bio). After one year (2019-2020), we had 68 followers. As of November 2021, our Instagram followers have **increased to 129 followers**. This social media platform has been successful at gaining local grower engagement as well as small farms and farm related industry across the Pacific Northwest.

Strategy for 2022

Expanding SFU Audience

In 2020 we cleaned up our 20-year-old mailing list. We have had a reduction in our SFU mailing list subscribers, with 267 unsubscribed and 386 cleaned contacts*. *Cleaned contacts occur when email addresses are no longer valid, or the recipient has not opened emails in over a year. We've started gaining actively reading subscribers in 2021 and will continue that into 2022. Forty-seven percent of SFU subscribers are over the age of 65 and 22% below the age of 44. By targeting the various social media platforms, we hope to continue to diversify the demographics of our readers and establish a strong social media presence for disseminating the SFU.