

Virus-tested *Rubus* Cultivars in the USDA Research Collection

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Abstract. The status of indexing for the presence of virus or viruslike diseases is given for USDA holdings of *Rubus* cultivars that have been tested at Corvallis, Oregon through 1980. Twenty-six of 31 blackberry cultivars; 9 of 12 black raspberry cultivars; and 42 of 52 red and purple raspberry cultivars were found to be free of known virus and viruslike diseases when indexed by a combination of sap transmission, leaf grafting, and serological testing.

Virus and viruslike diseases in cultivated *Rubus* in North America were reviewed in a handbook in 1970 (3). Standard methods for indexing *Rubus* cultivars for the presence of these diseases were reviewed in 1979 (1). These methods were used for the present compilation of indexing results on the USDA *Rubus* cultivar collection assembled at Corvallis, OR.

All cultivars were potted in pasteurized soil, held without flowering in screened enclosures, and treated with systemic pesticides to reduce the chances of infection by nematode-, pollen-, or insect-borne viruses and viruslike diseases. Annual indexing was performed on the standard indicators, *Chenopodium quinoa*, Willd. and cucumber (by sap inoculation), and Munger black raspberry seedlings and Malling Landmark red raspberry (by leaflet grafting). In some cases special indexing tests to *Rubus henryi* Hemsl. & Kuntze, Norfolk Giant red raspberry, and *Fragaria vesca* L. var. *semperflorens* (Duch.) Ser. cv. Alpine strawberry were conducted, as well as direct serological tests of *Rubus* sap

by enzyme-linked immunosorbent assay (ELISA) (1).

Results are presented in a series of six tables. In each table, the number immediately following the cultivar name denotes the year in which that particular clone was released for commercial distribution by USDA, ARS. This system is used to permit replacement of clones as technical advances lead to the development of improved clones. The letter M following a cultivar indicates that it was tip-propagated in tissue culturing from a shoot tip 500 μ m or less by size, from a mother plant exposed to prolonged heat treatment at 38°C (5). The USDA plans to heat-treat and tip-propagate all of the major U.S. *Rubus* cultivars in an effort to develop cleaner clones.

In Table 1, 26 blackberry cultivars are listed which index free from known viruses. Five of these cultivars are heat-treated tip propagants (Boysen-72M, Marion-81M, Olallie-UCBM, Thornless Logan-ACM, and Thornless Oregon Evergreen-81M). The five blackberry cultivars listed in Table 2 indexed positive for leaf-graft-transmissible diseases on one or more indicators. The identity of the causal agents of these diseases is not known.

Table 3 lists nine black raspberry cultivars that indexed negative in all tests. In Table 4, three black raspberry cultivars are listed, each infected with unknown transmissible diseases.

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Table 5 lists 42 red and purple raspberry cultivars that indexed negative in all tests. Five of the red raspberry cultivars are heat-treated tip propagants (Canby-81M, Fairview-81M, Meeker-81M, Puyallup-81M and Willamette-80M). In Table 6, ten red raspberry cultivars are listed that are infected with unidentified, transmissible diseases.

Frazier (2), Nyland and Enbelbrecht (4), and R. H. Converse and F. C. Mellor (unpublished data) have found *F. vesca* to be a useful indicator host for several graft-transmissible diseases from *Malus*, *Prunus*, *Rosa*, and *Rubus* cultivars. In the present study *F. vesca* cv. Alpine was found to express symptoms when leaf-grafted with several

Table 1. Blackberry cultivars in the USDA research collection at Corvallis, OR, Jan. 1981 that tested free from known virus or viruslike diseases on the indicator plants shown.

Cultivar	Source of clone	Indicators ^a							Notes
		Cq	Cuc	Mun	Rh	ML	NG	Alp	
Aurora-65	Oregon State U.	x ^b	x	x	x	x	NT ^c	x	
Bailey-65	USDA Beltsville	x	x	x	NT	x	NT	x	V ^d
Black Satin-79	USDA Beltsville	x	x	x	NT	x	NT	NT	V
Boysen-72 M	Oregon State U.	x	x	x	x	x	x	x	
Brazos-76	Texas A&M U.	x	x	x	NT	x	NT	NT	V
Brisson-80	Texas A&M U.	x	x	x	NT	x	NT	NT	
Cascade-65	Oregon State U.	x	x	x	x	x	NT	x	V
Cherokee-79	U. Arkansas	x	x	x	NT	x	NT	NT	
Cheyenne-78	U. Arkansas	x	x	x	NT	x	NT	NT	
Comanche-75	U. Arkansas	x	x	x	NT	x	NT	NT	
Darrow-65	USDA Beltsville	x	x	x	x	x	NT	x	
Dirksen Thornless-79	USDA Beltsville	x	x	x	NT	x	NT	NT	
Early Harvest-78	U. Illinois	x	x	x	NT	x	NT	NT	
Ebony King-78	U. Illinois	x	x	x	NT	x	NT	NT	
Lucretia-65	USDA Beltsville	x	x	x	x	x	NT	x	V
Marion-81M	Oregon State U.	x	x	x	x	x	x	x	E ^e
Olallie UCBM	U. of California	x	x	x	NT	x	x	NT	E
Philadelphia-78	W. Germany	x	x	x	NT	x	NT	NT	
Raven-67	USDA Beltsville	x	x	x	x	x	NT	NT	
Rosborough-80	Texas A&M U.	x	x	x	NT	x	NT	NT	
Santiam-75	Oreg. commercial	x	x	x	NT	x	NT	NT	V
Smoothstem-66	USDA Beltsville	x	x	x	x	x	NT	x	
Thornless Logan-ACM	Agr. Canada	x	x	x	NT	x	NT	x	E
Thornless Oregon									Calico-free
Evergreen-81M	Oregon State U.	x	x	x	NT	x	NT	NT	E
Womack-80	Texas A&M U.	x	x	x	NT	x	NT	NT	
Young-65	Oregon State U.	x	x	x	x	x	x	x	

^aIndicator plant symbols:

Cq = *Chenopodium quinoa* Willd.

Cuc = cucumber (*Cucumis sativus* L.)

Mun = Munger black raspberry open pollinated seedlings (*Rubus occidentalis* L.)

Rh = *Rubus henryi* Hemsl. & Kuntze

ML = Malling Landmark red raspberry (*Rubus idaeus* L.)

NG = Norfolk Giant red raspberry (*Rubus idaeus* L.)

Alp = Alpine strawberry seedlings *Fragaria vesca* var. *semperflorens* (Duch.) Ser.

^bx = OK.

^cNT = not tested

^dV = some of the plants indexed positive for virus or viruslike diseases, but a clone indexing negative in the

group was identified and propagated.

^eE = indexed negative for raspberry bushy dwarf, tobacco streak, and tomato ringspot viruses by ELISA

(enzyme-linked immunosorbent assay).

Table 2. Blackberry cultivars in the USDA research collection at Corvallis, OR, Jan. 1981, that tested positive for the presence of virus or viruslike diseases on one or more of the indicator plants shown.

Cultivar	Source of clone	Cq	Cuc	Mun	Indicators ^a		Alp	Notes
					Rh	ML		
Carolina-65	USDA Beltsville	x ^b	x	x	x	x	MD ^c	
Chehalem-65	Oregon State U.	x	x	x	x	x	CS ^d	
Eldorado-65	USDA Beltsville	x	x	Ep ^e	x	MD	MD	E ^f
Snyder-79	U. Illinois	x	x	RM ^g	NT ^h	x	NT	
Thornfree-66	USDA Beltsville	x	x	x	x	x	MD	

^aSee Table I footnote ^a for explanation of indicators.

^bx = OK.

^cMD = mottle and/or distortion.

^dCS = chlorotic spots.

^eEp = epinasty.

^fE = indexed negative for raspberry bushy dwarf, tobacco streak, and tomato ringspot viruses by ELISA (enzyme-linked immunosorbent assay).

^gRM = raspberry mosaic disease.

^hNT = not tested.

Table 3. Black raspberry cultivars in the USDA research collection at Corvallis, OR, Jan. 1981, that tested free from known virus and viruslike diseases on the indicator plants shown.

Cultivar	Source of clone	Cq	Cuc	Mun	Indicators ^a		Alp	Notes
					Rh	ML		
Allen-65	NY AES	x ^b	x	x	x	x	x	
Black Hawk-64	Iowa State U.	x	x	x	x	x	x	
Bristol-69	Ohio AES	x	x	x	x	x	x	
Cumberland-69	Ohio AES	x	x	x	x	x	x	
Huron-71	NY AES	x	x	x	NT ^c	x	NT	
Jewel-76	NY AES	x	x	x	NT	x	NT	
Munger-81M	Oreg. commercial	x	x	x	x	x	NT	E ^d
New Logan-69	Penn. commercial	x	x	x	x	x	x	
Plum Farmer-69	Oregon State U.	x	x	x	x	x	x	

^aSee Table I footnote ^a for explanation of indicators.

^bx = OK.

^cNT = not tested.

^dE = indexed negative for raspberry bushy dwarf, tobacco streak, and tomato ringspot viruses by ELISA (enzyme-linked immunosorbent assay).

Table 4. Black raspberry cultivars in the USDA research collection at Corvallis, OR, Jan. 1981, that tested positive for the presence of virus or viruslike diseases on one or more of the indicator plants shown.

Cultivar	Source of clone	Cq	Cuc	Indicators ^a		ML	Alp
				Mun	Rh		
Allegany-71	U. Maryland	LL ^b	M ^c	x ^d	NT ^e	x	NT
Morrison-64	Oregon State U.	x	x	x	NT	x	M
Shuttleworth-64	NY commercial	x	x	VC ^f	x	x	x

^aSee Table I footnote ^a for explanation of indicators.

^bLL = local lesions.

^cM = mottle.

^dx = OK.

^eNT = not tested.

^fVC = vein clearing on old leaves.

Table 5. Red and purple raspberry cultivars in the USDA research collection at Corvallis, OR, Jan. 1981, that tested free from known virus or viruslike diseases on the indicator plants shown.

Cultivar	Source of clone				Indicators ^a		NG	Alp	Notes
		Cq	Cuc	Mun	Rh	ML			
Boyne-65	Agr. Canada	x ^b	x	x	x	x	NT ^c	x	
Brandywine-80	NY AES	x	x	x	NT	x	NT	NT	
Canby-81M	Agr. Canada	x	x	x	NT	x	NT	NT	E ^d
Chilcotin-79	Agr. Canada	x	x	x	NT	x	x	NT	E
Citadel-66	U. Maryland	x	x	x	x	x	NT	NT	
Clyde-64	NY AES	x	x	x	x	x	x	x	
Cuthbert-64	Agr. Canada	x	x	x	x	x	NT	x	
Dormanred-73	U. Mississippi	x	x	x	NT	x	NT	NT	
Fairview-81M	Oregon State U.	x	x	x	x	x	x	x	E
Fallred-65	U. New Hampshire	x	x	x	x	x	NT	NT	
Haida-79	Agr. Canada	x	x	x	NT	x	x	NT	
Heritage-79	NY AES	x	x	x	NT	x	NT	NT	E
Indian Summer-65	NY commercial	x	x	x	x	x	NT	x	
Latham-62	Michigan State U.	x	x	NT	x	x	x	x	
Liberty-80	Iowa State U.	x	x	x	NT	x	NT	NT	
Lloyd George-SCRI	Scottish Crop Res. Inst.	x	x	x	NT	x	NT	NT	
Madawaska-68	Agr. Canada	x	x	x	NT	x	NT	NT	
Malling Landmark-SCRI	Scottish Crop Res. Inst.	x	x	NT	x	NT	NT	x	E
Meeker-81M	Oregon State U.	x	x	x	x	x	NT	NT	E
Miranda-64	Agr. Canada	x	x	x	NT	x	NT	NT	V ^e
Mitra-AC	Agr. Canada	x	x	x	x	x	x	NT	
Newburgh-61	Agr. Canada	x	x	x	x	x	NT	x	
Nootka-79	Agr. Canada	x	x	x	NT	x	x	NT	E
Norfolk Giant-SCRI	Scottish Crop Res. Inst.	x	x	NT	x	NT	NT	x	
Pathfinder-78	USDA-Wyoming	x	x	x	NT	x	NT	NT	V
Prestige-79	U. New Hampshire	x	x	x	NT	x	NT	NT	
Puyallup-81M	Wash. commercial	x	x	x	x	x	x	x	E
Reveille-66	U. Maryland	x	x	x	x	x	NT	NT	
St. Regis-64	Oreg. commercial	x	x	x	x	x	NT	x	
Scepter-66	U. Maryland	x	x	x	x	x	NT	x	
Sentinel-66	U. Maryland	x	x	x	x	x	NT	NT	
Sentry-78	Penn. commercial	x	x	x	x	x	NT	x	V
September-64	NY commercial	x	x	x	x	x	NT	x	
Skeena-79	Agr. Canada	x	x	x	NT	x	NT	x	E
Sodus-65	NY AES	x	x	x	x	x	NT	x	
Southland-79	S. Illinois U.	x	x	x	x	x	NT	NT	
Success-65	U. New Hampshire	x	x	x	x	x	NT	x	
Taylor-62	NY AES	x	x	x	x	x	NT	x	
Trailblazer-78	USDA-Wyoming	x	x	x	NT	x	NT	NT	
Viking-78	Vt. Dept. Agr.	x	x	x	NT	x	NT	NT	
Washington-62	Wash. commercial	x	x	x	x	x	NT	x	
Williamette-80M	Oregon State U.	x	x	x	x	x	x	x	E

^aSee Table 1 footnote ^a for explanation of indicators.^bx = OK.^cNT = not tested.^dE = indexed negative for raspberry bushy dwarf, tobacco streak, and tomato ringspot viruses by ELISA (enzyme-linked immunosorbent assay).^eV = some of the plants indexed positive for virus or viruslike diseases, but a clone indexing negative in the group was identified and propagated.

Table 6. Red and purple raspberry cultivars in the USDA research collection at Corvallis, OR, Jan. 1981, that tested positive for the presence of virus or viruslike diseases on one or more of the indicator plants shown.

Cultivar	Source of clone	Indicators ^a							
		Cq	Cuc	Mun	Rh	ML	NG	Alp	Notes
Amethyst-78	Iowa State U.	SN ^b	M ^c	x ^d	NT ^e	x	NT	NT	
Baumforth Sdlg. A-SCRI	Scottish Crop Res. Inst.	x	x	BRN ^f	NT	LM ^g	x	NT	
Baumforth Sdlg. B-SCRI	Scottish Crop Res. Inst.	x	x	BRN	NT	x	NT	NT	
Durham-61	Minn. commercial	x	x	x	x	x	NT	M	
Hilton-65	NY AES	x	x	x	x	x	NT	OL ^h	
Marcy-64	Agri. Canada	RBDV ⁱ	x	x	x	x	NT	M	
Milton-63	NY commercial	x	x	x	x	x	NT	LM,RS ^j	
Newman-64	USDA Beltsville	x	x	BRN	NT	LM	NT	NT	
Sumner-68	Agri. Canada	x	x	VN ^k	x	x	x	x	E ^m
Trent-65	Mass. commercial	YS ^l	x	x	NT	x	NT	NT	

^aSee Table I footnote ^a for explanation of indicators.

^bSN = systemic necrosis.

^cM = mottle.

^dx = OK.

^eNT = not tested.

^fBRN = black raspberry necrosis disease (Frazier, 1970).

^gLM = leaf mottle.

^hOL = oakleaf.

ⁱRBDV = raspberry bushy dwarf virus (Converse, 1979).

^jRS = ringspot.

^kVN = vein necrosis.

^lYS = yellow spots.

^mE = indexed negative for raspberry bushy dwarf, tobacco streak, and tomato ringspot viruses by ELISA (enzyme-linked immunosorbent assay).

Rubus cultivars that indexed negative on other indicators. Conversely, Alpine remained symptomless after leaf grafting with several *Rubus* cultivars that were found by other tests to be infected.

Propagations of all cultivar clones listed in Tables 1-6 are being placed in the new USDA-Oregon State University Northwest Plant Germplasm Repository at Corvallis, OR.

Literature Cited

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