



Annual Report 2010: Hard Cider
Carol Miles, Jonathan Roozen, Andrew Zimmerman,
and Jacqueline King
WSU Mount Vernon NWREC
16650 State Route 536, Mount Vernon, WA 98273
Tel. 360-848-6150 Email milesc@wsu.edu
<http://maritimefruit.wsu.edu/>

TITLE : Evaluation of Apple Varieties for Hard Cider Production

PERSONNEL:

Carol A. Miles, Vegetable Extension Specialist, WSU Mount Vernon NWREC
Jonathan Roozen, Associate in Research, WSU Mount Vernon NWREC
Jacqueline King, Technical Assistant, WSU Mount Vernon NWREC
Andrew (Drew) Zimmerman, Tulip Valley Vineyard and Orchard, 16163 State Route 536, Mount Vernon, WA 98273

OBJECTIVES:

1. To evaluate certain hard cider apple varieties and determine bloom dates, fruit set, and juice characteristics (brix, pH, percent acid, percent tannin) in northwest Washington.
2. To make results available to growers and cider producers.

SUMMARY: Bottling of 4 cider apples (Kingston Black, Dabinett, Frequin Rouge, and Brown Snout) harvested in 2009 was done in January 2010. Two cider apple varieties (Campfield, Metais) were harvested and pressed for cider making in 2010; they will be bottled Spring 2011. Observations of bloom time and bloom density were recorded in April-May. At harvest, juice samples were collected from 24 cider apple varieties grown at WSU Mount Vernon NWREC, and analyzed for percent tannin, brix, pH and titratable acid. Cider School courses formerly offered by WSU Mount Vernon NWREC were conducted in 2010 by the Northwest Agriculture Business Center of Mount Vernon: introductory courses June 28-July 2 and October 18-22, and an advanced course December 13-17, 2010.

METHODS:

Our field planting currently includes a total of 63 cider apple varieties in 3 field blocks:

Block 1: 31 cider apple varieties of 3 - 5 trees each, includes: 6 varieties established in 1994; from 1999 to 2005, 3 varieties were removed and 14 were added; in 2005, 7 new varieties were added; in 2006 an additional 7 varieties were added;

Block 2: A trellis planting of 5 cider apple varieties selected from the original varieties in Block 1, in 4 rows closely spaced (3x12, 4x12, 5x12 and 6x12) on strongly dwarfing rootstocks (M27 and M9) with 40-60 trees per row, established to investigate mechanical harvest;

Block 3: 32 cider apple varieties, single trees planted in 2004 and 2006; includes classic American cider varieties and other varieties from the European cider making centers of England and France.

Observations for varieties not previously evaluated included recording of bloom date and density once a week, beginning in early April to the end of May 2010. Fruit maturity was evaluated weekly during the harvest season using the starch conversion iodine test as a ripeness indicator for picking. Juice of 24 varieties was analyzed for brix, titratable acid, pH and tannins, and fruit of 2 cider apple varieties was harvested for cider making. Annual reports were made public through the Fruit Horticulture web pages, and a new Extension Bulletin PNW621 “Hard Cider Production and Orchard Management in the Pacific Northwest” (48 pp.) was published in November 2010, summarizing the last 15 years of research in hard cider varieties and cider making at WSU Mount Vernon NWREC.

RESULTS AND DISCUSSION:

Objective 1. To evaluate hard cider apple varieties and determine productivity (fruit yield and quality) in northwest Washington.

The weather pattern in early 2010 was unusually warm, with daily temperature highs in the range of 55oF to 60o F recorded beginning in mid January (source: AgWeatherNet). Some varieties bloomed very early (beginning in the first week of April), followed by a cold spell that extended the bloom to the end of May for late blooming varieties. Observations made of bloom dates and bloom density from 2000 to 2010 indicate that some varieties bloom abundantly each year, while others appear to have a tendency to alternate bearing (Table 1). Early blooming varieties such as Granniwinkle, Jouveaux, and Golden Russet are of special interest as their early bloom date makes them less susceptible to fire blight (*Erwinia amylovora*) infection. This is of particular importance in areas such as Central and Eastern Washington where that disease is problematic. In 2010 productivity in all varieties was lower than average and several did not set fruit at all, or had only a few specimen fruits. Harvested fruit was processed, and fruit juice analyzed (Table 2). Varieties with higher tannins tend to impart more body and viscosity to ciders when blended with standard dessert apples. As a result of poor cropping in some varieties, and of limited research funding, only 2 varieties (Campfield, Metais) were harvested for cider making in 2010; they will be bottled Spring 2011.

Objective 2. To make results available to growers and cider producers.

Annual reports were made public through the Fruit Horticulture web pages. Extension Bulletin PNW621 “Hard Cider Production and Orchard Management in the Pacific Northwest” (48 pp.) was published in November 2010, summarizing the last 15 years of research in hard cider varieties and cider making, containing information on cider making and variety analysis useful both for beginning and more experienced cider makers.

Cider School courses formerly offered by WSU Mount Vernon NWREC were conducted in 2010 by the Northwest Agriculture Business Center of Mount Vernon: introductory courses June 28-July 2 and October 18-22, and an advanced course December 13-17, 2010. A one-day cider workshop, sponsored by Snohomish County Extension and taught by Gary Moulton, was held at Sultan on October 9, 2010.

Over the years, this research has provided growers with information on the characteristics of apple varieties selected for hard cider production. Several local commercial cideries have been established, and plantings of cider cultivars were initiated. .

ACKNOWLEDGEMENTS

Support for this project from the Washington Wine Advisory Board and the Northwest Cider Society is gratefully acknowledged.

OUTSIDE PRESENTATIONS OF RESEARCH:

Moulton, G.A., 2010. Principles and Practice of Cider Making: Orchard Technology in Hard Cider Production. Cider School class and field demonstration, WSU Mount Vernon NWREC, Mount Vernon WA, June 29, 2010.

Moulton, G.A., 2010. Workshop presentation, "Hard Cider Making and Orchardring." Snohomish County Extension Field Day, Sultan, WA, October 9, 2010.

Moulton, G.A., 2010. Principles and Practices of Cider Making: Orchard Technology in Hard Cider Production. Cider School class and field demonstration, WSU Mount Vernon NWREC, Mount Vernon WA, October 19, 2010.

Moulton, G.A., C. Miles, J.King, and A. Zimmerman. 2010. Bulletin PNW621 Hard Cider Production and Orchard Management in the Pacific Northwest. Washington State University, November 2010, 48 pp.

FUND STATUS

Wine Advisory Board, Washington State Department of Agriculture - \$ 3,000
Northwest Cider Society - \$1,500

Table 1. Mean date of full bloom in cider apple varieties observed at WSU Mount Vernon NWREC, 2000-2010, listed in order from mean earliest to latest bloomers (data not collected 2005 and 2006; all varieties were not available for observation in all years).¹

Variety	Mean	2010	2009	2008	2007	2004	2003	2002	2001	2000
Ross Nonpareil	4/15	4/15								
Maude	4/28	4/19	5/7							
Granniwinkle	4/29	4/15	5/7	5/5						
Grimes Golden	4/29	4/21	5/7							
Golden Russet	4/29	4/15	5/13	5/10	4/30	4/14	5/6			
Jouveaux	4/29	4/15	5/7	5/7						
Vagner Ascher	4/30	4/17	5/13							
Grindstone	4/30	4/17	5/7	5/7						
Smith's Cider	4/30	4/22	5/9							
Roxbury Russet	5/1	4/17	5/7	5/10	4/28	4/16	5/6	5/15	5/2	4/28
Track Zero (Ross Sdlg)	5/1	4/22	5/7	5/9	4/28					
Campfield	5/2	4/22	5/13							
Amere de Berthcourt	5/3	4/22	5/15							
Zabergau Reinette	5/3	4/18	5/7	5/16						
Fillbarrel	5/4	4/26	5/13							
Tom Putt	5/4	4/26	5/13	5/16	5/7	4/23	5/13			
Cap of Liberty	5/5	4/22	5/7	5/16	5/7					
Metais	5/6	4/29	5/13							
Redstreak	5/6	4/29	5/13	5/16	5/7	4/26				
Tremlett's Bitter	5/6	4/27	5/7	5/16	5/7					
Muscat de Bernay	5/7		5/7							
Reine des Pommes	5/7		5/13		5/7	4/23	5/13			
Finkenwerder Herbstprinz	5/7	4/22	5/13	5/18	5/7					
Bramley's Seedling	5/8		5/13	5/16	5/7	4/23	5/11			
Foxwhelp	5/8				5/7	4/23	5/13	5/15	5/9	5/11
Harrison	5/8	4/23	5/13	5/18						
Bulmer's Norman	5/8	4/27	5/13	5/16	5/7	4/28	5/19			
Brown's Apple	5/9					4/23	5/13	5/15	5/16	
Frequin Rouge	5/9	5/7	5/7	5/16	5/7					
Bouteville	5/10		5/7	5/13						
Bramtot	5/10	5/7	5/13							
Doux Normandie	5/10	5/7	5/13							
Reine des Hatives	5/10	5/7	5/13	5/18	5/5					
Sweet Alford	5/11		5/7	5/16						
Michelin	5/11	5/7	5/15	5/18	5/7	4/25	5/13	5/21	5/16	
Taylor's	5/12		5/13						5/11	5/11
Crow Egg	5/12		5/7	5/16						
Whidbey	5/12	5/7	5/13	5/16						
Muscadet de Dieppe	5/12		5/13	5/18	5/7	4/28	5/13	5/21	5/16	5/11
Kingston Black	5/12	5/7	5/19	5/25	5/7	4/25	5/13	5/21		
Kermerrien	5/14	5/13	5/13	5/16	5/15					
Peau de Vache	5/14	5/7	5/19	5/18						
Taliaferro	5/15		5/13	5/16						
Yarlington Mill	5/15	4/29	5/13	5/18	5/15	4/30	5/19	5/21	5/19	5/11

Chisel Jersey	5/16		5/19	5/18	5/15	4/30	5/19	5/21	5/19	
Stembridge Jersey	5/16	5/20	5/13							
Harry Masters' Jersey	5/18	5/19	5/19	5/30	5/15	5/3	5/19	5/21	5/19	
Major	5/18	5/19	5/19	5/16						
Dabinett	5/18	5/19	5/19	5/25	5/17	5/3	5/22	5/21	5/17	
American Forestier	5/19	5/19	5/19							
Blanc Mollet	5/19	5/19	5/19							
Brown Thorn	5/19	5/19	5/19							
Coat Jersey	5/19	5/19	5/19	5/18						
Frequin Audievre	5/19	5/19	5/19							
Frequin Tardif	5/19	5/19	5/19							
Lambrooke Pippin	5/19	5/19	5/19							
Sweet Coppin	5/19	5/19	5/19							
Royal Jersey	5/21	5/21	5/21							
Brown Snout	5/23	5/27	5/27		5/22	5/4	5/22	5/31	5/29	
Vilberie	5/24	5/27	5/27	5/30	5/22	5/4	5/22	5/31	5/29	
Breakwell Seedling	5/24	5/27	5/27	5/22	5/22					
Cort Pendu Rose	5/25	5/19	5/19	5/30						
Red Jersey	5/25			5/25						
Cort Pendu Plat	5/25	5/19	5/19	5/30						
Stoke Red	5/27									
Cimitiere	5/29	5/27	5/27	5/30						
Medaille D'Or	5/29	5/29	5/29							

¹In 2010, bloom dates of 2 dessert apples (Gravenstein, 4/11; Jonagold,4/15) were recorded for comparison.

Table 2. Mean bloom density of cider apple varieties observed at WSU Mount Vernon NWREC, 2000-2010, listed in descending order (data not collected 2005 and 2006; all varieties were not available for observation in all years).¹

Variety ²	Mean	2010	2009	2008	2007	2004	2003	2002	2001	2000
Ross Nonpareil	5.00	5								
Granniwinkle	5.00	5	5	5						
Jouveaux	5.00	5	5	5						
Doux Normandie	4.75	5	4.5							
Peau de Vache	4.67	5	4	5						
Bulmer's Norman	4.58	5	5	5	5	3.5	4			
Bramtot	4.50	4	5							
Metais	4.50	4	5							
Golden Russet	4.50	5	5	5	5	4	3			
Fillbarrel	4.50	5	4							
Grimes Golden	4.50	5	4							
Maude	4.50	5	4							
Vagner Ascher	4.50	5	4							
Michelin	4.31	5	5	3.5	5	2.5	5	3.5	5	
Frequin Rouge	4.25	4.5	3.5	4	5					
Campfield	4.25	5	3.5							
Tom Putt	4.17	5	5	3.5	5	4	2.5			
Brown Snout	4.08		5		4	4	4	3.5	4	
Tremlett's Bitter	4.00	4	3.5	3.5	5					
Foxwhelp	3.92				5	3	3.5	5	3	4
Brown's Apple	3.75					3.5	3.5	4.5	3.5	
Cap of Liberty	3.75	2	5	3	5					
Yarlington Mill	3.67	4.5	1.5	4.5	2	4.5	4	4	4	4
Harrison	3.67	4	4	3						
Finkenwerder										
Herbstprinz	3.63	4	4	3	3.5					
Redstreak	3.60	4	3.5	4	3.5	3				
Track Zero (Ross Sdlg)	3.50	1	5	3	5					
Stembridge Jersey	3.50	3	4							
Zabergau Reinette	3.50	3	4.5	3						
Harry Masters' Jersey	3.43		4	2.5	5	3	3	3	3.5	
Kermerrien	3.38	1	5	2.5	5					
Roxbury Russet	3.28	3	3.5	4	4	3	3	3	3	3
Taylor's	3.25	0	5						4	4
Breakwell Seedling	3.25	4	0	5	4					
Chisel Jersey	3.25	0	5	5	4	3	3.5	3.5	2	
Kingston Black	3.21	2.5	4.5	2.5	5	2	4	2		
Dabinett	3.13	1	4.5	2.5	5	3	3	3	3	
Smith's Cider	3.00	1	5							
Bouteville	3.00	0	5	4						
Cort Pendu Plat	3.00	2	4	3						
Muscadet de Dieppe	2.94	0	3	4	2.5	4	2.5	3.5	3	4
Reine des Pommes	2.92	0	5	0	5	2.5	5			
Bramley's Seedling	2.58	1	3.5	2	3	2	4			
Vilberie	2.57	0		3	3.5	3	2.5	3	3	
American Forestier	2.50	0	5							
Blanc Mollet	2.50	0	5							
Frequin Audievre	2.50	0	5							
Muscat de Bernay	2.50	0	5							

Grindstone	2.50	3	2.5	2						
Lambrooke Pippin	2.50	3	2							
Cimitiere	2.33	0	5	2						
Cort Pendu Rose	2.33	0	4	3						
Crow Egg	2.33	0	5	2						
Major	2.33	0	5	2						
Amere de Berthcourt	2.33	2	4	1						
Whidbey	2.33	2	3	2						
Royal Jersey	2.00	0	4							
Sweet Alford	2.00	0	4	2						
Sweet Coppin	2.00	0	4							
Reine des Hatives	1.88	2	1.5	2	2					
Coat Jersey	1.67	0	4	1						
Red Jersey	1.67	0	1	4						
Taliaferro	1.67	0	3	2						
Brown Thorn	1.50	0	3							
Stoke Red	1.00	1								

¹ Abundance rating:

1= Very few blooms

2= Light bloom, below needed amount to set commercial crop

3= Normal bloom, sufficient to set commercial crop

4= Abundant bloom, between normal and snowball- thinning may be required

5= Snowball bloom, very abundant, may cause alternate bearing if not thinned early

² In 2010, bloom density of 2 dessert apples, Gravenstein (5) and Jonagold (5) was recorded for comparison.

Table 3. Percent tannin, brix, pH and titratable malic acid in juice of apples grown and tested at WSU Mount Vernon NWREC in 2008 - 2010, listed in descending order by % tannin in 2009¹.

Sample	Tannin %			Brix			pH			Malic Acid g/L		
	2010	2009	2008	2010	2009	2008	2010	2009	2008	2010	2009	2008
Medaille D'Or	1.02	1.75	- ²	14.0	17.2	-	4.26	4.37	-	3.32	3.54	-
Vilberie	0.58	0.91	0.41	11.5	12.0	14.2	4.13	3.60	3.89	2.57	3.43	3.86
Bramtot	0.56	-	-	14.3	-	-	4.15	-	-	2.95	-	-
Amere de Berthcourt	0.48	0.68	DNF ³	13.5	14.0	DNF	4.23	4.47	DNF	2.14	2.26	DNF
Reine des Pommes	DNF	0.67	DNF	DNF	14.9	DNF	DNF	4.21	DNF	DNF	3.38	DNF
Nehou	-	0.61	0.22	-	14.2	15.0	-	4.56	4.01	-	3.10	3.81
Frequin Rouge	DNF	0.57	0.19	DNF	12.2	10.8	DNF	4.57	4.20	DNF	2.58	2.73
Red Jersey	DNF	DNF	0.26	DNF	DNF	11.0	DNF	DNF	4.38	DNF	DNF	1.72
Domaines	-	0.52	0.24	-	15.0	16.0	-	4.53	4.16	-	2.09	2.79
Lambrooke Pippin	-	0.51	-	-	14.4	-	-	2.86	-	-	10.61	-
Stembridge Jersey	-	0.48	-	-	12.9	-	-	4.69	-	-	2.41	-
Coat Jersey	-	0.48	-	-	11.8	-	-	3.72	-	-	1.93	-
Doux Normandie	0.27	0.48	-	11.0	13.0	-	4.02	3.58	-	3.27	3.86	-
Kermerrien	0.48	0.46	0.34	13.2	12.8	14.0	3.82	3.86	4.00	2.54	2.47	2.23
Royal Jersey	-	0.45	DNF	-	12.2	DNF	-	4.13	DNF	-	1.50	DNF
Stoke Red	-	0.43	0.30	-	13.2	13.0	-	4.04	3.50	-	6.22	7.50
Chisel Jersey	1.00	0.43	-	15.6	14.2	-	4.49	4.93	-	3.38	1.88	-
Yarlington Mill	0.29	0.38	0.11	14.0	14.0	11.0	3.97	4.97	4.04	2.73	1.72	2.68
Marie Menard	0.35	-	-	13.6	-	-	4.41	-	-	2.03	-	-
Foxwhelp	-	0.33	-	-	14.0	-	-	3.01	-	-	10.18	-
Cimitiere	-	0.33	-	-	11.2	-	-	4.90	-	-	1.39	-
Breakwell Seedling	0.64	0.32	0.12	12.0	11.0	10.4	3.18	3.17	3.43	13.56	5.36	6.97
Muscat de Berney	-	0.32	-	-	12.0	-	-	3.68	-	-	2.57	-
Hewes	0.32	-	-	15.0	-	-	3.29	-	-	10.66	-	-
Ribston Pippin	0.26	DNF	0.11	17.6	DNF	14.8	3.77	DNF	3.48	4.80	DNF	6.54
Dabinett	0.69	0.32	0.23	14.9	14.0	14.2	4.38	4.90	4.47	2.57	1.34	1.93
Blanc Mollet	-	0.30	-	-	11.4	-	-	4.27	-	-	1.50	-
Harry Masters' Jersey	-	0.30	DNF	-	12.0	DNF	-	4.18	DNF	-	1.72	DNF
Metais	0.51	0.30	-	15.8	12.0	-	4.40	4.33	-	3.20	1.29	-
Major	-	0.29	0.22	-	13.4	14.8	-	4.24	4.42	-	1.82	1.82
Frequin Tardif	-	0.28	-	-	12.0	-	-	4.36	-	-	2.58	-
Tremlett's Bitter	-	0.28	0.17	-	11.8	12.2	-	2.88	3.44	-	9.86	10.34
Campfield	0.19	0.27	-	13.2	13.0	-	4.46	4.63	-	2.73	2.63	-
Michelin	0.26	-	-	12.8	-	-	4.11	-	-	3.10	-	-
Cap O'Liberty	DNF	0.26	0.18	DNF	11.0	12.0	DNF	2.89	3.38	DNF	9.87	13.67
Kingston Black	0.37	0.26	0.13	16.0	13.4	13.0	3.66	3.22	3.70	8.52	5.63	5.90
Brown Snout	0.20	0.26	0.08	12.0	12.0	13.0	3.77	3.73	4.10	2.95	3.00	2.95
Bulmer's Norman	-	0.25	0.17	-	11.2	11.8	-	3.94	4.06	-	1.88	1.77
Muscadet de Dieppe	DNF	0.24	DNF	DNF	14.0	DNF	DNF	3.84	DNF	DNF	2.30	DNF
Marin Oufroy	0.32	0.24	-	16.6	14.2	-	4.57	4.47	-	3.00	2.84	-
Frequin Audievre	-	0.23	-	-	12.0	-	-	4.75	-	-	1.40	-
Dymock Red	-	0.21	0.19	-	13.0	14.4	-	4.07	4.29	-	1.82	2.03
Peau de Vache	DNF	0.19	0.09	DNF	11.0	12.4	DNF	3.71	4.08	DNF	3.00	2.52

Sample	Tannin %			Brix			pH			Malic Acid g/L		
	2010	2009	2008	2010	2009	2008	2010	2009	2008	2010	2009	2008
American Forestier	-	0.19	-	-	11.8	-	-	3.63	-	-	1.98	-
Harrison	0.14	0.19	-	15.6	16.0	-	3.69	2.94	-	8.25	10.08	-
Taliaferro	-	0.19	-	-	10.2	-	-	2.87	-	-	6.81	-
Golden Russet	-	0.18	0.10	-	15.0	18.0	-	3.93	3.72	-	7.93	6.38
Track Zero Seedling	DNF	0.17	-	DNF	12.0	-	DNF	3.97	-	DNF	1.61	-
Bouteville	-	0.16	-	-	12.0	-	-	4.43	-	-	1.17	-
Bramley's Seedling	DNF	0.16	0.11	DNF	10.0	12.8	DNF	3.63	3.35	DNF	10.18	10.29
Zabergau Reinette	DNF	0.16	0.10	DNF	11.9	16.4	DNF	3.85	3.66	DNF	6.27	8.95
Tom Putt	0.22	0.16	0.08	11.8	11.0	11.2	3.37	3.77	3.52	6.54	6.27	7.24
Whidbey	DNF	0.15	0.07	DNF	11.9	14.4	DNF	3.96	3.53	DNF	4.88	8.30
Grindstone	DNF	0.15	-	DNF	11.4	-	DNF	3.18	-	DNF	5.25	-
Sweet Alford	-	0.15	0.06	-	11.0	14.6	-	4.77	4.32	-	1.34	2.89
Finkenwerder Herbstprinz	0.06	0.15	0.06	12.9	14.6	14.0	3.23	2.96	3.44	9.27	11.36	10.13
Redstreak	DNF	0.15	0.06	DNF	12.0	12.0	DNF	2.99	3.36	DNF	8.74	9.86
Court Pendu Rose	0.14	-	-	13.2	-	-	3.75	-	-	6.70	-	-
Smith's Cider	DNF	0.12	-	DNF	11.0	-	DNF	3.15	-	DNF	4.28	-
Mott Pink*	-	0.11	-	-	12.0	-	-	3.16	-	-	7.08	-
Roxbury Russet	DNF	0.11	0.07	DNF	16.4	17.0	DNF	3.31	3.85	DNF	4.77	5.41
Crow Egg	-	0.10	0.10	-	10.2	14.0	-	4.01	3.66	-	3.27	5.63
Reine des Hatives	-	DNF	0.10	-	DNF	14.0	-	DNF	4.34	-	DNF	2.47
Granniwinkle	-	0.10	0.05	-	10.4	12.0	-	1.58	3.80	-	1.82	3.48
Maude	DNF	0.10	-	DNF	12.0	-	DNF	3.40	-	DNF	4.82	-
Court Pendu Plat	DNF	0.10	-	DNF	13.0	-	DNF	2.93	-	DNF	7.72	-
Grimes Golden	0.06	-	-	12.0	-	-	3.43	-	-	6.54	-	-
Freyberg*	-	-	0.01	-	-	14.0	-	-	3.96	-	-	3.48

¹2009 was selected as the base year due to poor set on many trees in 2010.

²Blank (-) indicates data not collected (young trees, dessert apples tested only once, etc.)

³DNF = Did not fruit, mature tree in alternate year;

*dessert apple