

Characterization of grape cultivars suitable for growing in Southern Scandinavia

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Aim

The study aims at establishing a ranking and characterisation of cultivars relevant in a cold region where 'Müller Thurgau' is too late to ripen.

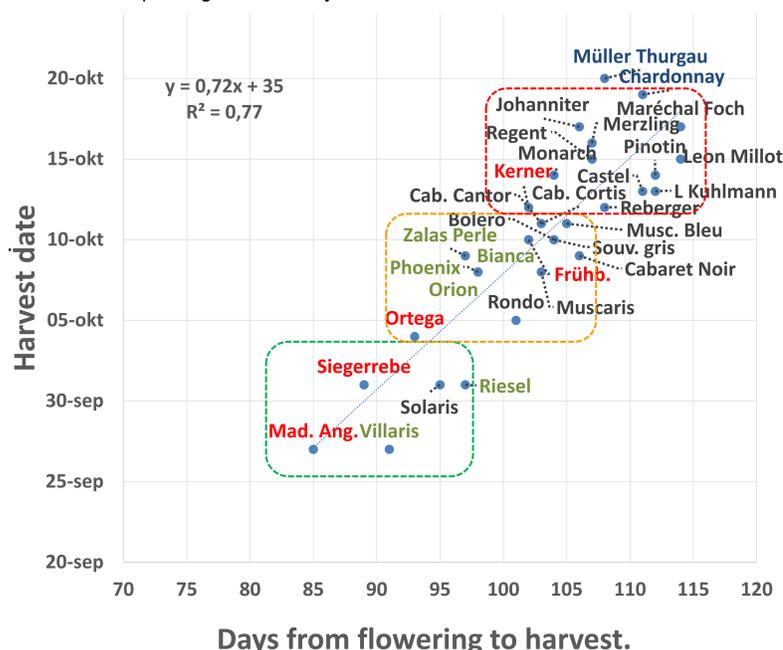
Abstract

Denmark (DK) is colder than traditional cool climate viticulture regions, but due to plant breeding, (e.g. in Germany) early/fast ripening cultivars have emerged. These cultivars still ripen rather late in DK, so the identification of early or late cultivars from classic cool climate environments do not apply in a cold Scandinavian climate context (IPGRI, UPOV and OIV, 1997). The scale has to be adapted and expanded. Parallel to the breeding, climate change have increased the average heat sum of the season and these two main drivers, pushes the area of possible wine growing into Scandinavia. During the climate norm period 1961-1990, the heat sum of the season (Mid April – mid October) was 585 ± 150 (10 °C base temp). The coldest year of the period (1987) only reached 400 while the warmest (1975) reached 780. However, since 1990 (the new 30 year norm) the average heat sum has increased to almost 800, equal to a +1 °C. Lately 2018 (the warmest year on record in DK) reached a heat sum of 1000 or a +2 °C warmer country average (Aru et al 2022). All though DK is a small country, the heat sum in 2018 varied from 850 in the coolest areas up to 1250 in the warmest, matching the historic levels of Champagne (Jackson and Schuster, 1997). However, years like 2015 and 2017 with only 600-700 in heat sum stresses that low heat sum requirement are essential. In an analysis of country wide data of 30 cultivars over the last 12 years, ripening times, yield and quality components are evaluated.

“Solaris showed to be the only cultivar with capacity to ripen at a high quality level in all years.

Methodology

Heat sum calculations were made from monthly mean temperature data from the Danish Meteorological Institute. Cultivar evaluations were based on 12 years data (2010-2021) collected from more than 50 growers (75% hobby, 25% commercial) spread out in the country, representing approx. 10% of the total viticultural area in DK. Data from the 30 most important cultivars were selected, representing an average annual harvest of 49 tons with 55% from blue and 45% from green cultivars. Details on cluster structure are based on data from the test field at Copenhagen University.



Figur 1: Average time of harvest in a 12 year period in relationship to the developmental time from flowering to harvest. Cultivars in red: viniifera, green = Pawi cultivars harvested for sparkling and not fully mature, blue = reference viniifera harvested as late as possible but not mature, black = Pawi cultivars. Green box = good in all years, yellow box = only good in some years in good locations, red box = only good in exceptional years in good locations.

Table 1. Maturity data for 30 cultivars + 2 classic reference cool climate cultivars. M = Main cultivars, T = test cv's only grown a few years, S = cv.'s grown for many years but in small scale and in many cases decreasing due to disease problems (*V. vinifera*).

Cultivar	Harvest time	Density	Acid	Index	Number years at ripeness levels						Use/ Wine style	Type
					Over the last 12 years							
					Based on Index							
	date	°Oe	g/l	°Oe x 10/ acid g/l	Yr*	Years without Data**	Very Unripe <65	Unripe 65-75	Ripe 75-85	Very Ripe >85	Sparkling, White, Rosé or Red	Main Test Special
Villarlis	Early** 27-sep	Very Low	High	Very unripe	8		5	1	1	1	Sparkling	T
Madeleine Angev.	Early 27-sep	Low	Medium	Very ripe	12		1	2	2	7	White	S
Riesel	Medium** 01-okt	Low	Medium	Ripe	7	1	1	1	2	2	Sparkling	T
Solaris	Medium 01-okt	High	Medium	Very well ripe	12				3	9	White	M
Siegerrebe	Medium 01-okt	Medium	Low	Over ripe	12	4				8	White	S
Ortega	Medium 04-okt	Medium	Medium	Very well ripe	12			1	3	8	White	M
Rondo	Medium 05-okt	Medium	High	Unripe	12		2	4	6		Red/Rosé	M
Zalas Perle	Medium/Late** 07-okt	Very Low	High	Unripe	12		5	4	1	2	Sparkling	M
Phoenix	Late** 08-okt	Very Low	High	Very unripe	12		7	3	2		Sparkling	M
Orion	Late** 08-okt	Very Low	High	Very unripe	12		7	2	3		Sparkling	M
Muscaris	Late 08-okt	Medium	High	Unripe	8		2	3	1	2	White/Sparkling	T
Bianca	Late** 08-okt	Low	Medium	Ripe	12	5	1	2		4	Sparkling	S
Cabaret Noir	Late 09-okt	Medium	Medium	Very ripe	8			1	2	5	Red	T
Souvenir Gris	Late 10-okt	Medium	High	Unripe	9		4	1	1	3	White/Sparkling	T
Bolero	Late 10-okt	Low	Medium	Unripe	12		3	6	2	1	Rosé/Sparkling	M
Frühburgunder	Late 10-okt	Low	Medium	Ripe	12	2	1	1	4	4	Rosé/Sparkling	S
Cabernet Cortis	Late 11-okt	Medium	High	Unripe	12		6	2	2	2	Rosé	M
Cabernet Cantor	Late 11-okt	Low	High	Unripe	10		4	2	3	1	Red	M
Muscat Bleu	Late 11-okt	Low	Medium	Unripe	12	1	3	3	2	3	Rosé	S
Kerner	Very Late 12-okt	Low	High	Very unripe	12	5	4		3		White	S
Reberger	Very Late 12-okt	Medium	High	Unripe	8	1	2	3	1	1	Red	T
Lucie Kuhlmann	Very Late 13-okt	Medium	High	Very unripe	12	6	4	2			Red	S
Castel	Very Late 13-okt	High	High	Unripe	8	3	3		1	1	Red	T
Monarch	Very Late 14-okt	Low	High	Unripe	12	7	1	1	3		Red	S
Pinotin	Very Late 14-okt	Low	Medium	Ripe	5		3			2	Red	T
Leon Millot	Very Late 15-okt	Medium	High	Ripe	12		2	5	3	2	Red	M
Regent	Very Late 15-okt	Low	Medium	Ripe	12		3	2	4	3	Red	M
Maréchal Foch	Ekstrem Late 17-okt	Medium	High	Unripe	12		5	3	1	3	Red	S
Merzling	Ekstrem Late 16-okt	Low	High	Very unripe	12	5	6		1		Sparkling	S
Johanniter	Ekstrem Late 17-okt	Low	Very High	Very unripe	12		10		2		Sparkling	M
Müller Thurgau	Ekstrem Late 20-okt	Very Low	High	Very unripe	12	3	8	1			-	Ref
Chardonnay	Ekstrem Late 20-okt	Very Low	Ekstrem High	Very unripe	12	3	9				-	Ref

* Years of data collection. Data from the last 12 years are included but cultivars grown very little data may in some years be missing. Others have only been tested the last 5-9 years. ** These are harvested early for sparkling wines. Time of maturity is in reality later. Ref = reference cultivars. The 2 reference cultivars do not ripen in Denmark. Therefore a harvest date of 20 October does not say much except that after this date plants are hit by frost or bad weather.

Results

An average harvest period of 23 days from 27 September to 20 October was determined (Table 1). The harvest time of a cv varied significantly from year to year (average SD 10,2, data not shown). An early cultivar was determined to ripen in September, medium from 1st to 7th October, and late cv's in the second week of October from 7th to 12th, while very late went to the very end of the growing season to 17th October. After this is considered extreme late and these do never ripen. Only in very warm years like 2016 and especially 2018, do the late and very late cultivars ripen. The only cultivar ripe with high quality grapes in all years was 'Solaris'. In warm years like 2016 and 2018 it tend to get very high in density resulting in potential alcohol levels of 14-15 vol% if yield is not kept high. It may also develop 'Nobel rot' and be used for sweet wines. 'Solaris' ripens in average October 1st, or approx. 3-4 weeks before 'Müller Thurgau'. 'Madeleine Angevine' and 'Siegerrebe' are early to medium ripening. Due to low acidity 'Siegerrebe' get overripe in warm years and both suffer from wasp attack and diseases.

The time from flowering to harvest is for early cultivars between 85 and 95 days, while late cultivars need 100-115 days (Figure 1). Early flowering cultivars flower in average around 23 June, while the late ones show a 12 year average flowering in the first days of July (data not shown). The 12 year average levels of most density expressed in Oechsle (°Oe), showed a variation among the cultivars with only 2 having high levels defined as 81-89 °Oe, while 11 reached middle levels between 73-81 °Oe. A majority of cv's only reached low or very low levels. For the acid level more than half of the cv's had high or very high levels, which were defined as 10-12 g/l and 12-14 g/l respectively. 11 cultivars had middle levels (8-10 g/l) while only 1 had a low level (6-8 g/l). The reference 'Müller Thurgau' were high in acid and very low in density. From the density and acid a maturity index was calculated and the cultivars grouped from very unripe to over ripe (see table 1).

Cluster size is one of the most important yield determinants depending on berry size and berry number/cluster. 2 cv's had very small (<100g/cluster), 10 small (100-175) and 12 medium (175-250) while 6 were either large (250-325) or very large (up to 450g). Berry size varied from very small <1,5 g up to 4,1g. Yield per m row varied from around 1 kg/m to 5,7 equal to a span in yield/ha of 3 to 17 tons (data not shown).

Conclusions

Even though many cultivars are grown by the Danish growers only 'Solaris' show constant high level of ripening in all years. It is also the dominant cv and together with the dominant blue cv 'Rondo' they represents more than 50% of the area. However, 'Rondo' only show sufficient ripening in 6 out of 12 years, which especially for red wine is very problematic. Cultivars with similar ripening profile as 'Solaris' are needed to consolidate the commercial industry.

References:

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