



# Extending storage period of organically grown apple cultivar "Topaz"

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## Introduction

The Dutch organic fruit growers aim at substitution of scab susceptible apple cultivars by scab resistant cultivars. For a long supply period of scab resistant cultivars some of these cultivars need to have a long storage period. In this framework the potential for long storage of the apple cultivar "Topaz" was studied. The main phenomena that restrict the length of the storage period of Topaz in the Netherlands are brown core, reduced firmness and gloeosporium rot. An important measure to reduce gloeosporium rot is a hot water treatment shortly after harvest. In the present study the focus lied on brown core and firmness.

## Materials and methods

During the seasons 05/06 and 06/07 two storage trials were carried out with four storage condition treatments. Oxygen and carbon dioxide concentration and temperature were varied in non-factorial schemes. Special features were reduction of oxygen concentration to 0.6% depending on ethylene production using DCS (Dynamic Control System, Veltman et al, 2003) and increase of temperature to 8° Celcius during one week, three times during the storage period. All treatments were carried out for two picking dates and with apples from one or two organic fruit farms. For every picking date the Streif-index was measured (Streif, 1989). Firmness was measured with an Instron using a cone with 1 cm<sup>2</sup> surface area.

Treatment description:

- Standard : 7 days 4°C then 1.5 °C, 1.2 %O<sub>2</sub>, 2.5% CO<sub>2</sub>
- Stand-DCS : as Standard except O<sub>2</sub> between 0.6-1.2%
- Early cooling: as Standard except first week at 0°C
- ULO-b : 7 days 4°C then 3 °C, 1.2 %O<sub>2</sub>, 0.5% CO<sub>2</sub>
- DCS-b : as ULO-b except O<sub>2</sub> between 0.6-1.2%
- Stand+8 : as Standard except 3 separate weeks at 8 °C during storage period

Streif, J., 1989. Erfahrungen mit Erntetermin-Untersuchungen bei Äpfeln. *Besseres Obst* 9/1989, 235-238.

Veltman, R.H. et al, 2003. Dynamic control system (DCS) for apples (*Malus domestica* Borkh. cv 'Elstar'): optimal quality through storage based on product response. *Postharvest biology and technology*, Vol. 27, nr1, pp. 79-86.

## Results

Storage condition /Picking date	Firmness (kg)				% brown core <sup>1)</sup>			
	A. <sup>2)</sup>		B. <sup>2)</sup>		A.		B.	
	Farm A; Results '05/'06 <sup>3)</sup>							
	March 22		May 9		March 22		May 9	
Standard/1	7.7	6.3	7.5	6.5	0	59	0	84
Standard/2	7.9	7.0	7.8	6.9	0	22	0	42
Stand DCS/1	8.3	7.3	8.0	7.6	0	28	0	42
Stand DCS/2	8.1	7.5	8.3	7.8	0	2	0	10
Early cooling/1	7.6	5.9	7.1	6.2	0	55	0	98
Early cooling/2	8.1	6.8	7.7	6.9	0	31	4	50
Farms A and B; average results '06/'07 <sup>4)</sup>								
	April 12		June 11		April 12		June 11	
Standard/1	6.5	5.7	6.3	5.4	4	22	11	70
Standard/2	5.7	4.7	6.3	5.2	4	27	10	48
ULO-b/1	5.3	5.0	5.7	5.4	0	0	0	6
ULO-b/2	5.2	5.0	5.2	5.0	0	0	0	7
DCS-b/1	5.4	5.0	5.6	5.3	0	0	0	7
DCS-b/2	5.6	5.6	5.2	4.9	0	0	0	2
Stand+8/1	6.6	6.0	6.4	5.8	0	2	0	30
Stand+8/2	5.1	4.9	5.8	5.5	0	8	0	38

<sup>1)</sup> Other storage disorders in '05/'06: March 22/A: 1-7%; March 22/B: 3-12%; May 9: 2-14% and in '06/'07: april 12: 2-5% June 11/A: 2-9% and June 11/B: 13-61%

<sup>2)</sup> A.: directly after storage; B: after 1 week at 10 °C and 1 week at 18 °C

<sup>3)</sup> apples picked at Streif-indexes of 0.17 (1=Oct 4) and 0.10 (2= Oct 11)

<sup>4)</sup> apples picked at Streif-indexes 0.09 (1= Oct 7) and 0.08 (2 = Oct 17)

Results show that

- Brown core was reduced after delayed picking (only in '05/'06), reduced oxygen concentration (only in combination with low storage temperature in 05/06 and picking at Streif-index of 0.10), temporal increased temperature ('06/'07) and increased temperature in combination with reduced carbon dioxide concentration ('06/'07).
- Firmness was increased by reduced oxygen concentration only when storage temperature was low ('05/'06), but was decreased by increased temperature in combination with reduced carbon dioxide concentration ('06/'07). Temporal temperature increase did not alter firmness levels.

## Discussion and conclusions

The picking dates in 2006 were late in comparison with the Dutch Streif-index-requirement for long storage (0.11). This explains the lower firmness in season '06/'07, which occurred for both farms. Brown core developed mainly in the shelf-life period. It was the predominant storage disorder except after shelflife after storage till June 11 in season '05/'06. The latter can be explained by the lower Streif-index at the picking dates and the longer storage period in season '06/'07.

It can be concluded that the storage period of Topaz can be extended with (1) DCS in combination with low storage temperature and picking at Streif-index of 0.10 or (2) with continuous or temporarily higher storage temperature. However before application replication of the research and some fine tuning of the storage conditions are needed.