

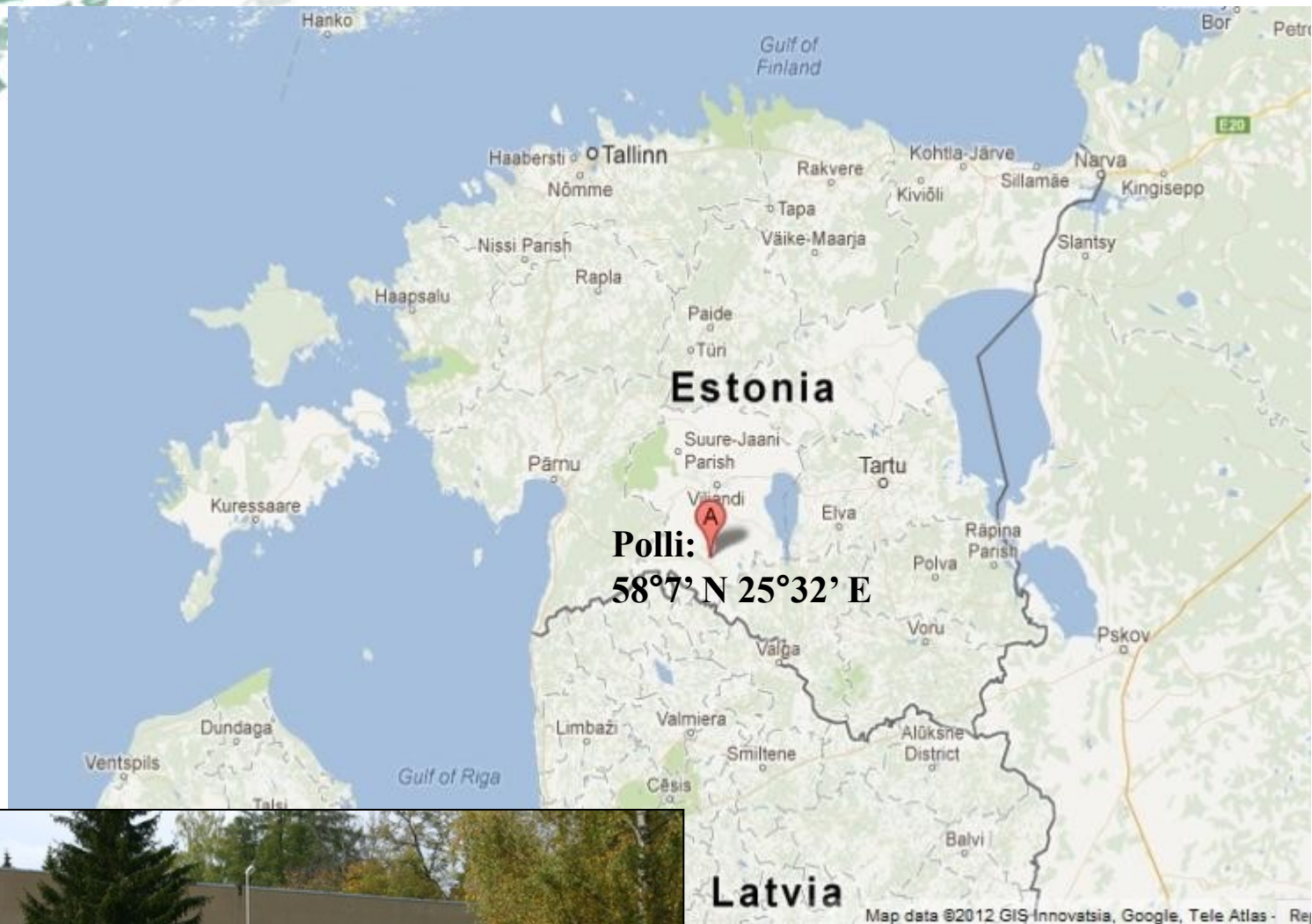
Changes of internal quality of some apple cultivars stored in normal and controlled atmosphere in Estonia

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Introduction

- In 2011, the area of fruit and berry plantations was 7000 ha
- 3300 ha pome fruit plantations
- Estonia's climate includes a great risk of cold damages to fruit trees
- **Good winter hardiness**





Introduction

- In commercial apple orchards established within the past 10 years, cultivars 'Krista', 'Talvenauding', 'Lobo' and 'Cortland' constitute about 20% of planted apple trees.
- Short storage period: no longer than 4-5 months.
- Most apples sold in Estonian markets are imported after January.

Research objectives

- Does controlled atmosphere (CA) storage extend storage period of locally grown apples?
- Storage recommendations.



Polli Horticultural Research Centre

- Modern cold storage facilities
- Reconstructed 2007/2008
- First screening of apples under CA started in 2008.



Materials

- 2 seasons 2009/2010 and 2010/2011
- **8 apple cultivars:**
'Krista', 'Talvenauding', 'Auksis',
'Antey', 'Alesya', 'Cortland',
'Sinap Orlovski' and 'Ligol'



'Krista'



'Auksis'



'Antey'

Methods

- Fruits were stored in a cold room at 2°C, at three atmospheres:
 - in air (NA)
 - CA conditions: 3% O₂ + 5% CO₂
 - 1.5% O₂ + 1.5% CO₂



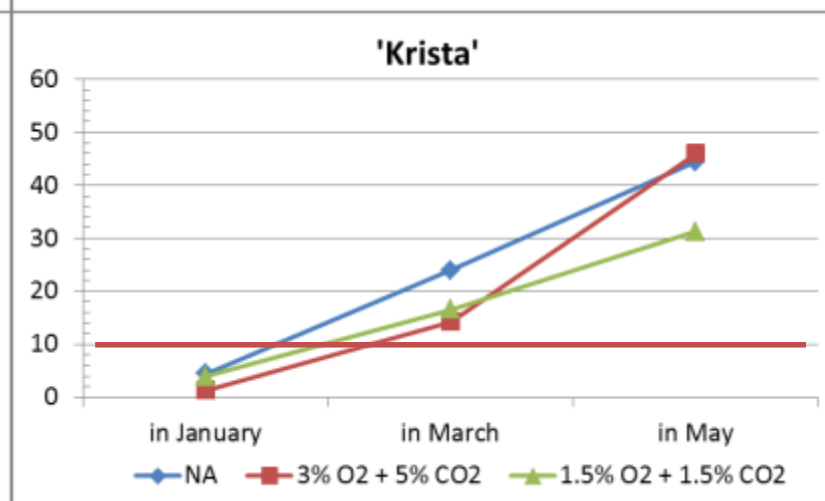
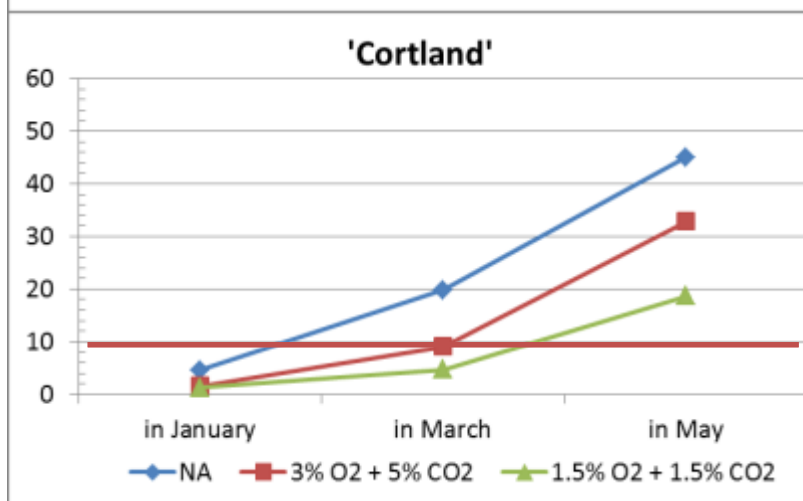
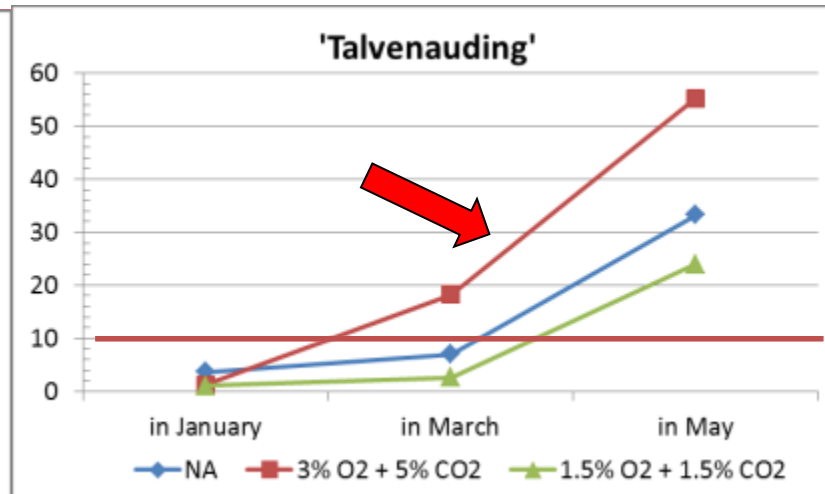
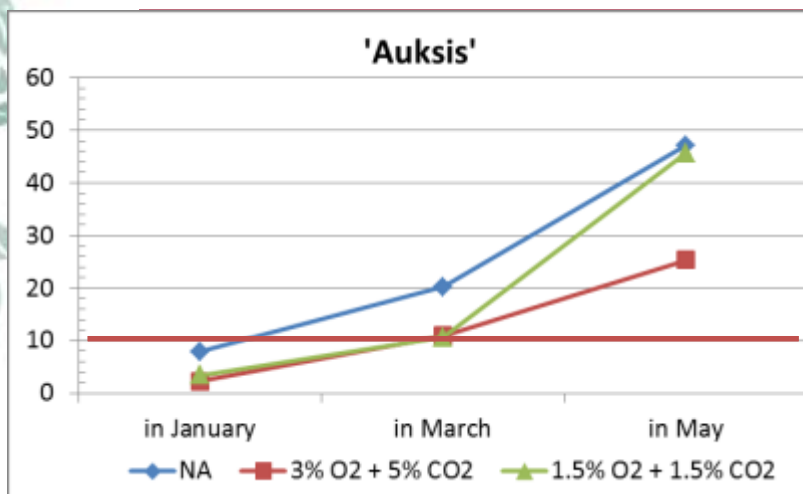
Methods

- Storage loss (weight loss, physiological and fungi-caused damages);
- Fruit flesh firmness (in newtons, N);
- Total soluble solids content (TSS, in °Brix);
- Titratable acidity;
- Measured at harvest, in January, March and May;



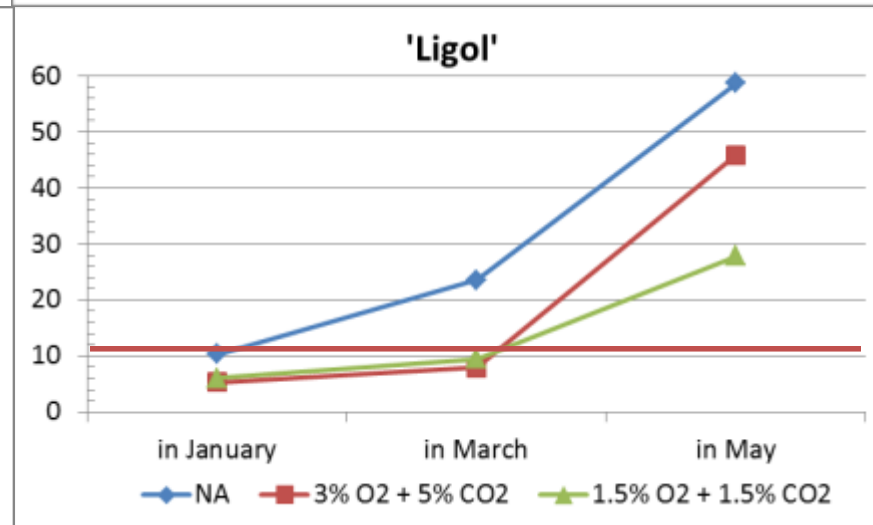
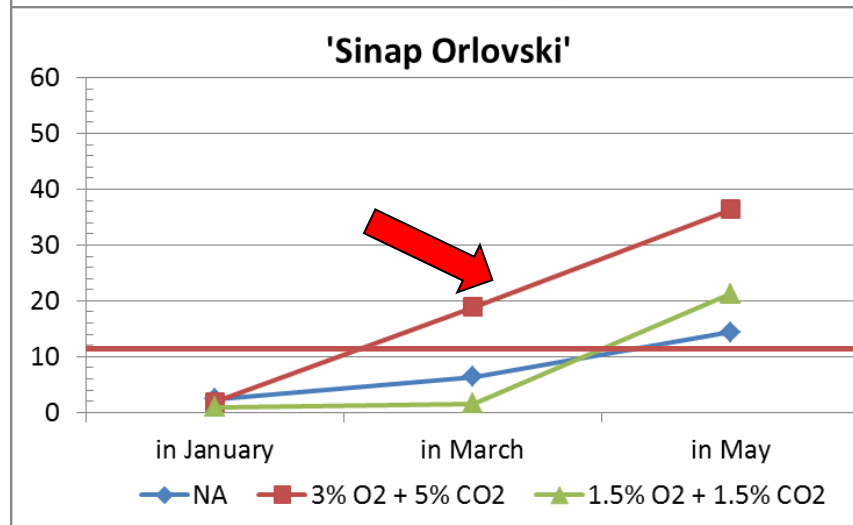
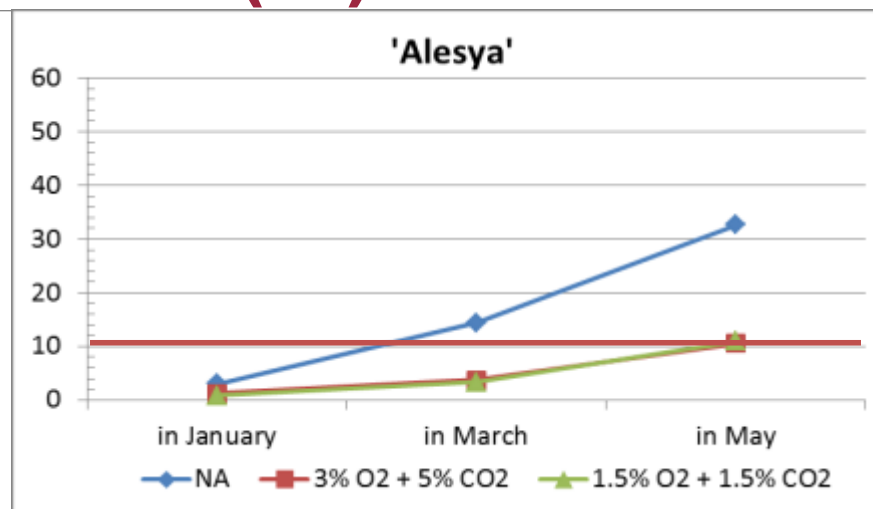
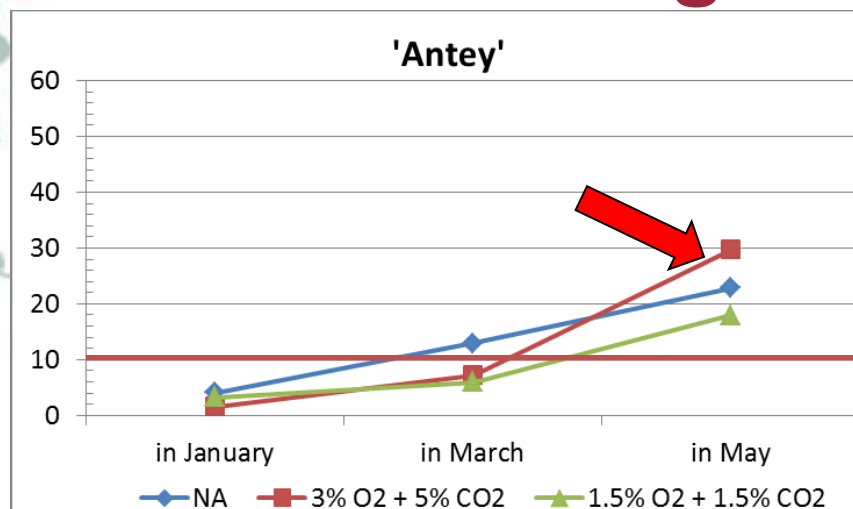
Results

Storage losses (%)



Results

Storage losses (%)



Flesh browning 'Talvenauding'



Normal atmosphere



3% O₂ + 5% CO₂

Flesh browning 'Antey'



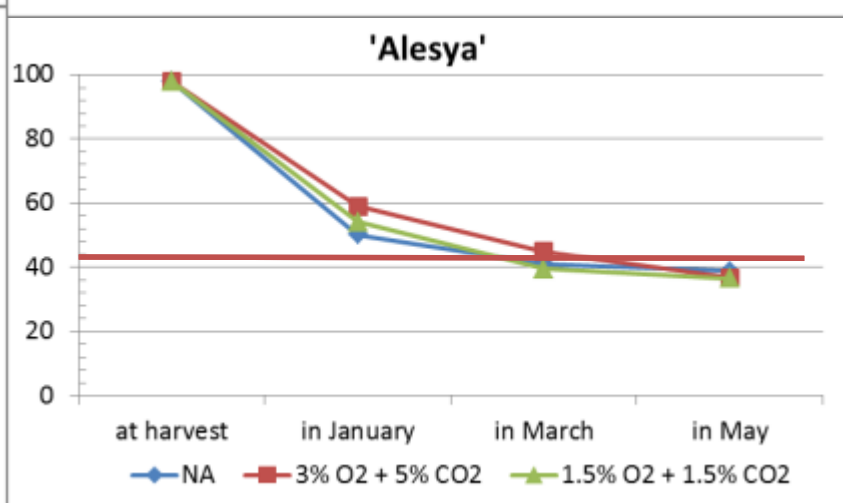
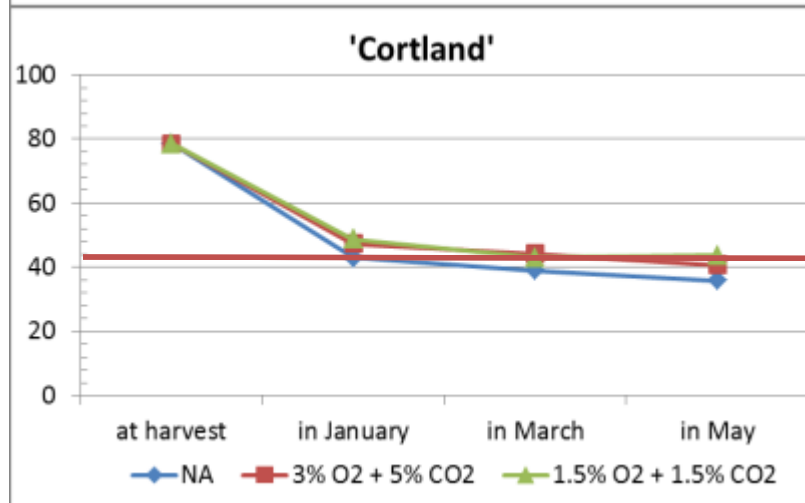
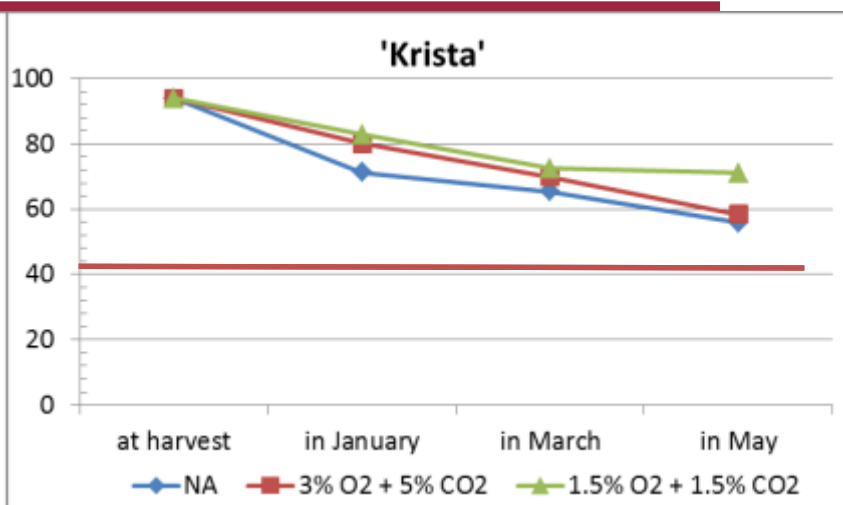
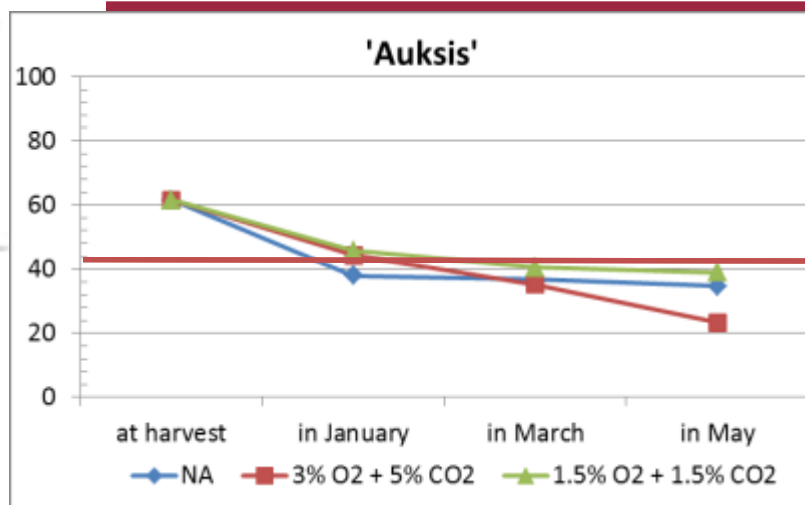
Normal atmosphere



3% O₂ + 5% CO₂

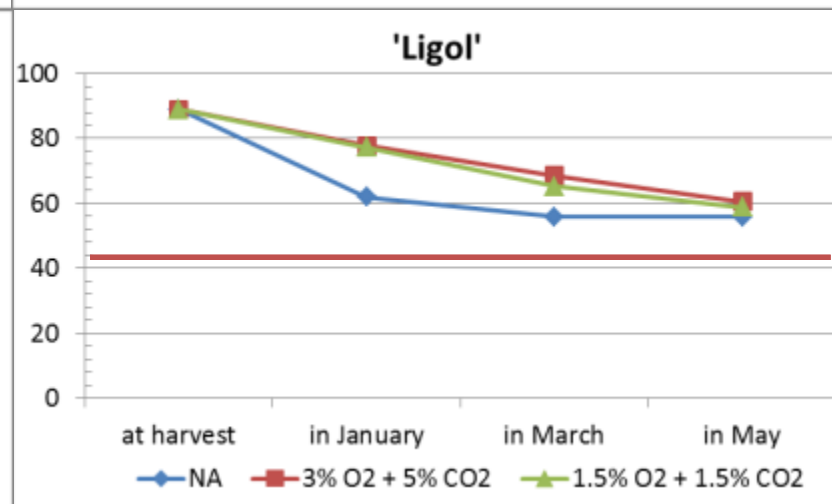
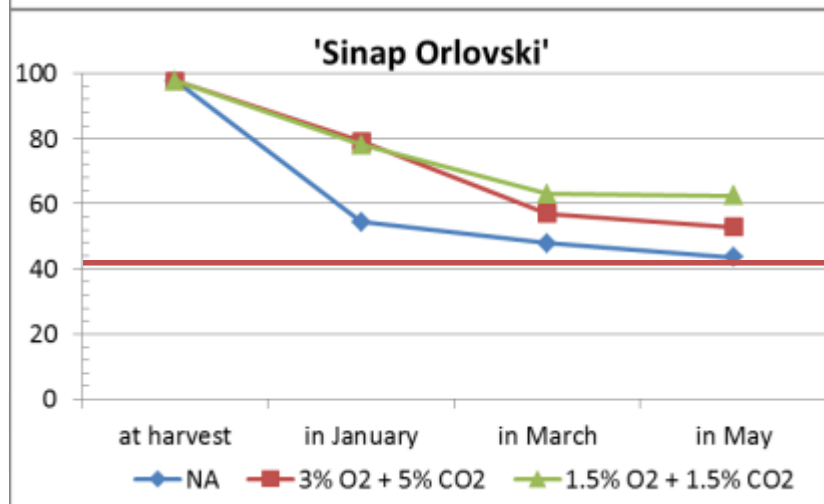
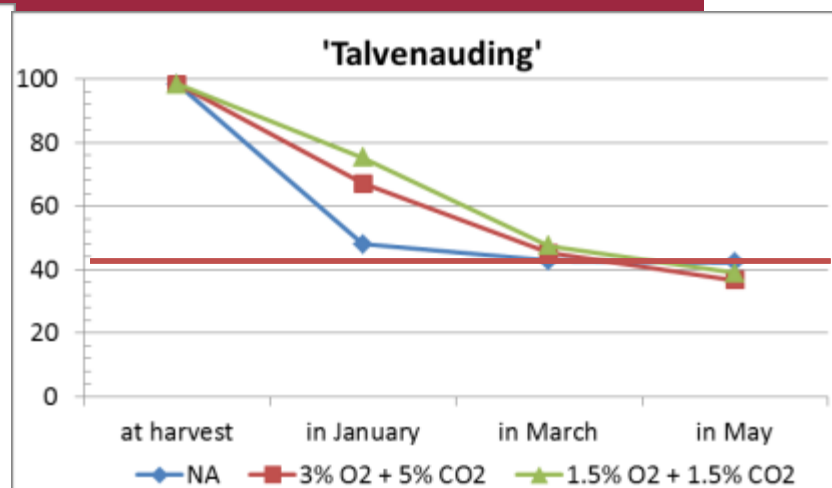
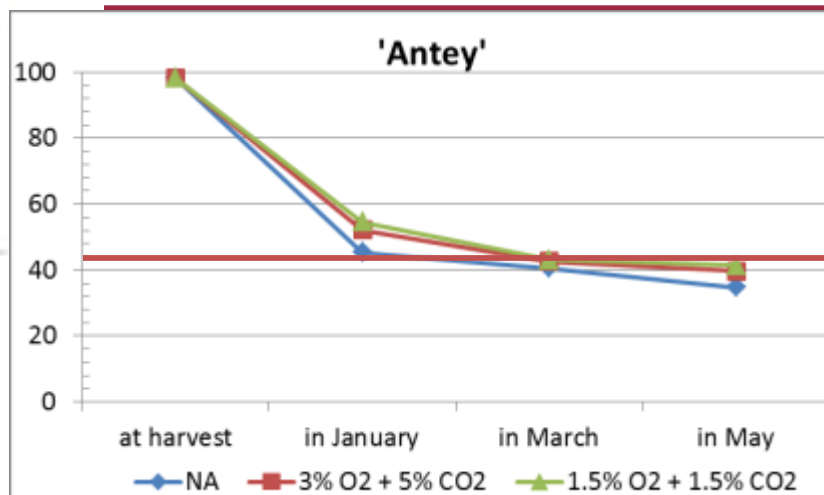
Results

Flesh firmness (N) retention



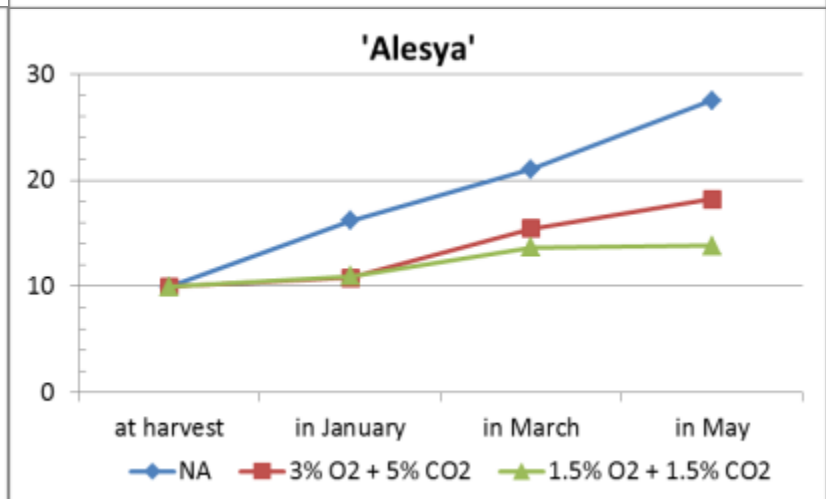
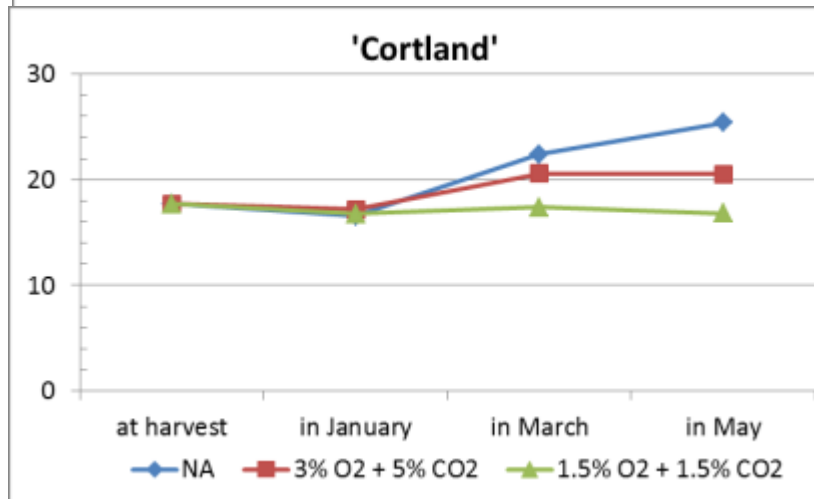
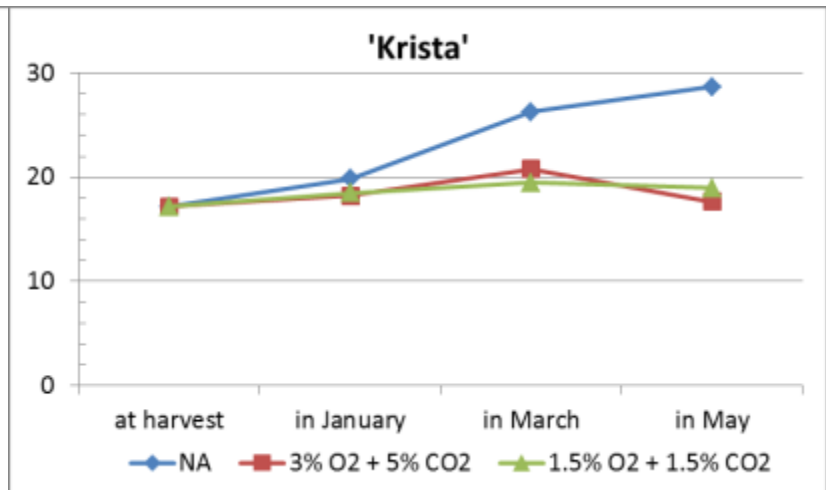
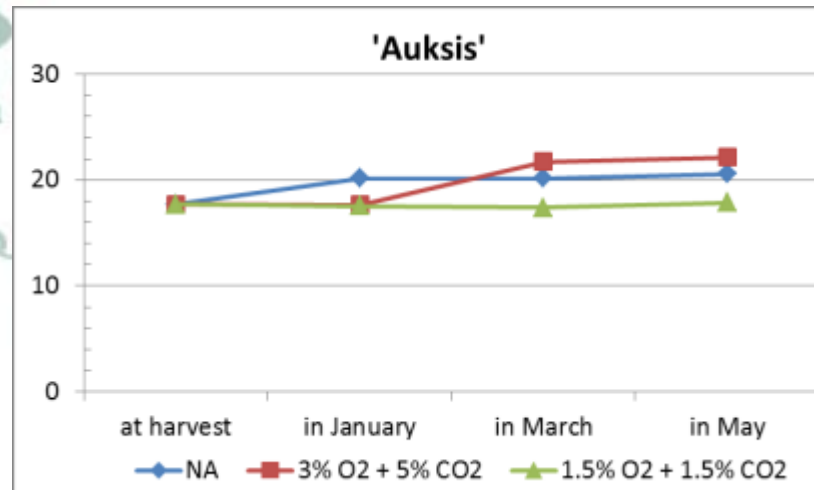
Results

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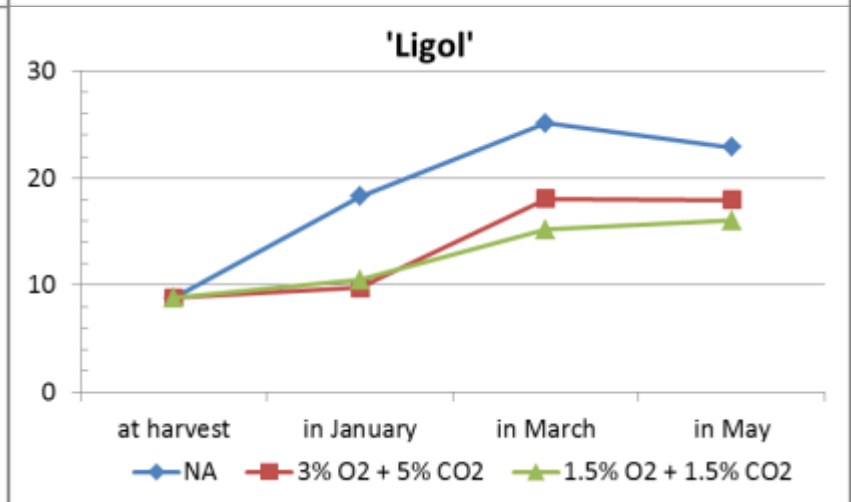
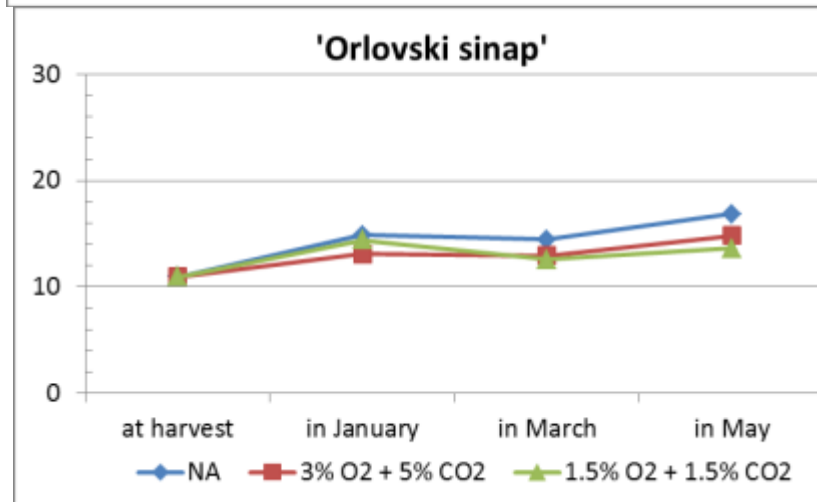
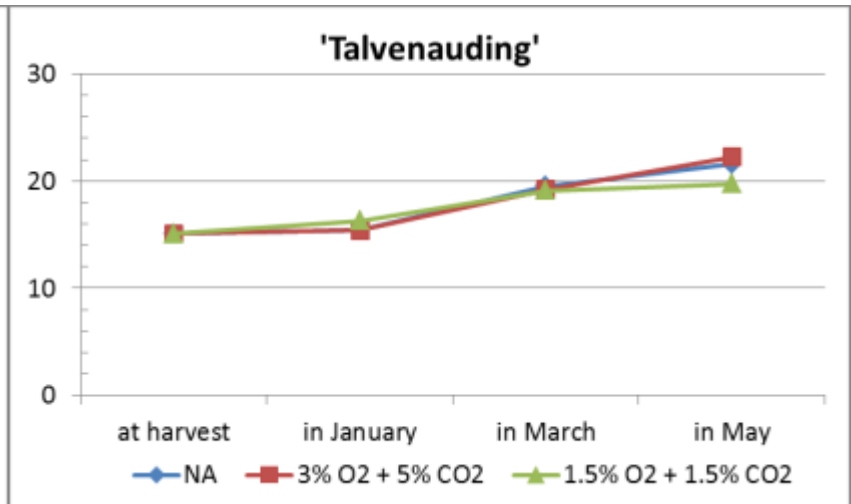
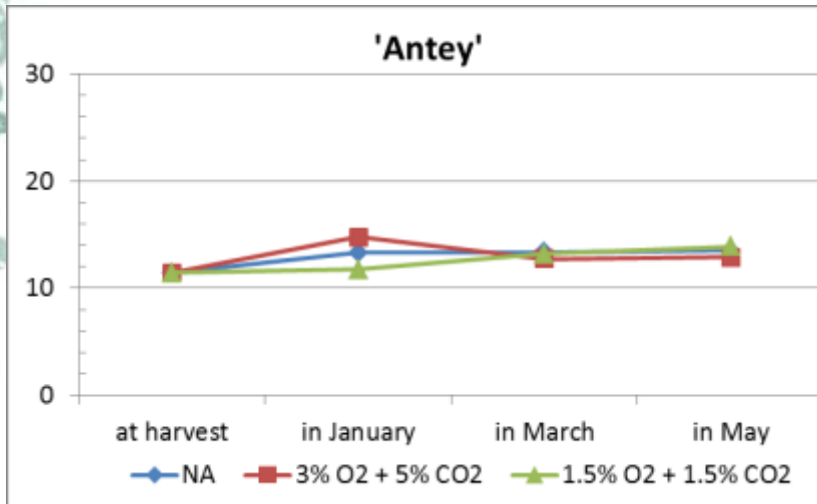
Results

TSS : titratable acidity



Results

TSS : titratable acidity



Results 'Ligol'



Normal atmosphere



1.5% O₂ + 1.5% CO₂

Conclusions

- In NA:
 - ‘Alesya’, ‘Auksis’, ‘Cortland’, ‘Krista’, ‘Talvenauding’ → JANUARY
 - ‘Antey’, ‘Sinap Orlovski’, ‘Ligol’ → MARCH
- In CA 1.5% O₂ + 1.5% CO₂:
 - ‘Alesya’, ‘Auksis’, ‘Cortland’, ‘Krista’, ‘Talvenauding’ → MARCH
 - ‘Sinap Orlovski’, ‘Ligol’ → MAY
- ‘Antey’ **NO EFFECT**

Conclusions

- In CA 3% O₂ + 5% CO₂:
 - ‘Antey’, ‘Talvenauding’, ‘Sinap Orlovski’

SENSITIVE TO HIGH CO₂



FLESH BROWNING



Acknowledgements

- Financial support:
 - Enterprise Estonia
 - Fruit growing companies:
 - Fruitexpert SP
 - Kadastik Õunaaed
 - Fiirels



European Union
Regional Development Fund



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