

# COLD STORAGE MAY ELONGATE THE FRESH CONSUMPTION PERIOD OF SOUR CHERRY (*PRUNUS CERASUS* L.)

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COST FoodWaStop in Ancona, 23-25 January 2024



# INTRODUCTION

- Sour cherries important role in fruit production (volume)
- Food industry vs fresh consumption
  - Hungarian cultivars - harmonic sugar/acid ratio
  - bioactive component
- Short shelf life
  - Physical changes (softness, color, size change)
  - Decay – Fungal infection



# INTRODUCTION

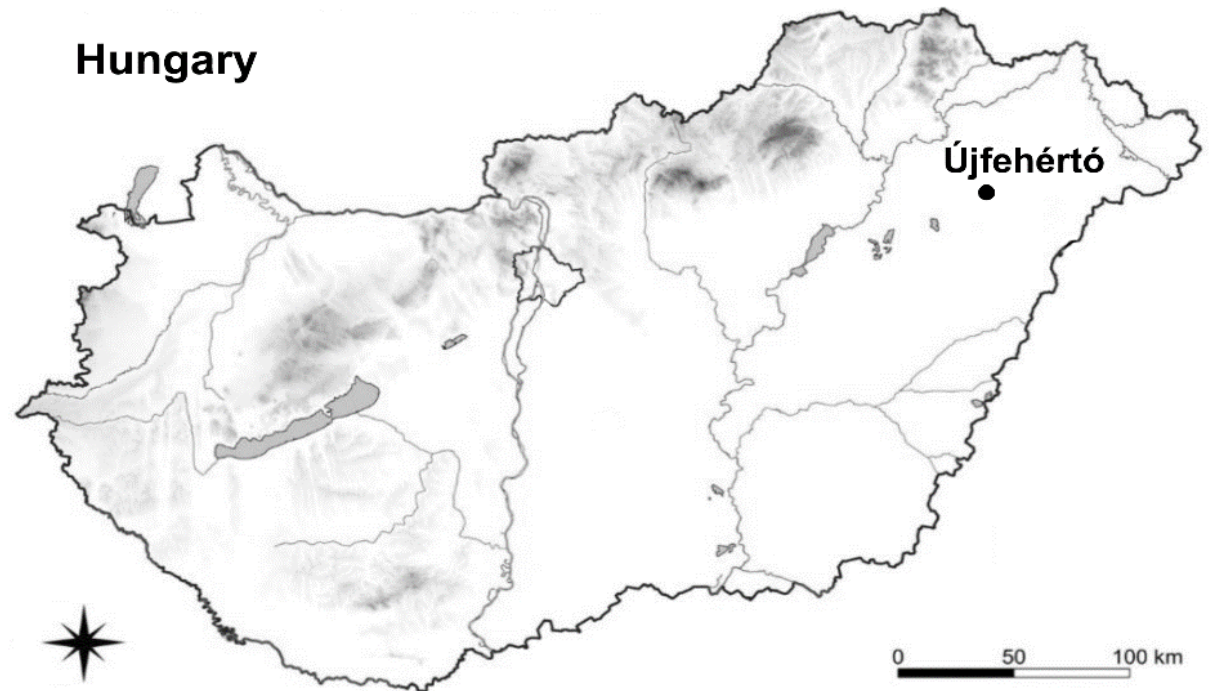
- No adequate sour cherry post-harvest technology
  - small proportion are marketed fresh
  - a huge percentage loss produce



- Investigate the shelf life, storage potential of Hungarian sour cherry cultivars

# MATERIAL AND METHODS

- Experiment location & time: Újfehértó (Research Institute of Újfehértó), 2016-2019
- Érdi bőtermő, Újfehértói fürtös, Petri
- Same plant protection strategy
- Harvested with stem, whole tree
- Intact, healthy sour cherries



# MATERIAL AND METHODS

## Harvest

Érdi  
bőtermő

Újfehértói  
fürtös

Petri

QUALITY  
CONTROL

## Examination I.

**Shelf life**

T=20°C, 14 days

**DSI**

(McKinney index)

**Fruit firmness**

(Durofel index)

**Cold storage**

T= 1±1°C, 6 weeks

**Normal Atmosphere**  
(NA)

**Modified atmosphere  
packaging**  
(MAP)

## Examination II.

**Shelf life**

T=20°C, 7 days

**Fruit firmness**  
(Durofel index)

**DSI**

(McKinney index)

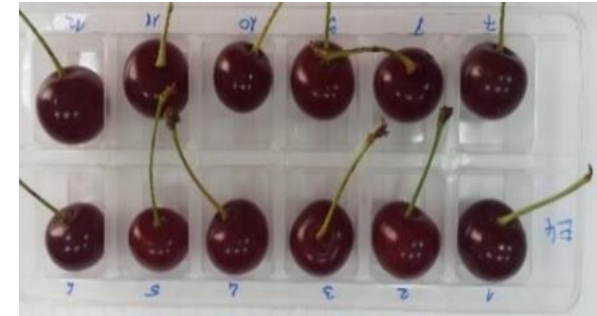
**Weight loss**  
(%)

**Healthy fruits ratio**  
(%)

# MATERIAL AND METHODS

## Shelf life test

- 12 healthy fruit (8 repetitions for each/year) 2016-2019
- 20 °C in dark, every second day checking
  - Ratio of healthy fruits
  - DSI according McKinney index
- Visible contaminations (mycelium, brown spots, softening)



$$\text{DSI (\%)} = \frac{\sum \text{Class frequency} \times \text{score of rating class}}{\text{Total number of observations} \times \text{Maximal disease index}} \times 100$$



Empirical 6-point scale:

0 - healthy fruit

1 - 1-15 %

2 - 15-30 %

3 - 30-50 %

4 - 50-75 %

5 - more than 75% fruit surface infection

# MATERIAL AND METHODS

## Cold storage conditions

- Six week at 0-2 °C
- Normal ambient atmosphere
- MAP Xtend Cherry (StePac LA Ltd., Tefen, Israel) plastic bags (passive)
- Sample amount: 5.0 kg, n=5 (cultivar, year)

$$\text{Weight loss (\%)} = \left( \frac{5.0 - m_s}{5.0} \right) \times 100$$

$m_s$  = weight of stored fruit following storage

$$\text{Ratio of healthy fruits (\%)} = \left( \frac{m_s - m_d}{m_s} \right) \times 100$$

$m_d$  = weight of decayed fruit following storage



# MATERIAL AND METHODS

## Fruit firmness

- A100D combined device (Agrosta SARL, France, sensor head type: A100-25, diameter 10 mm)
- Durofel index (Durofel index - scale 0-100 %)
- Data (cultivar, storage types, year) (n= 100 healthy fruits)

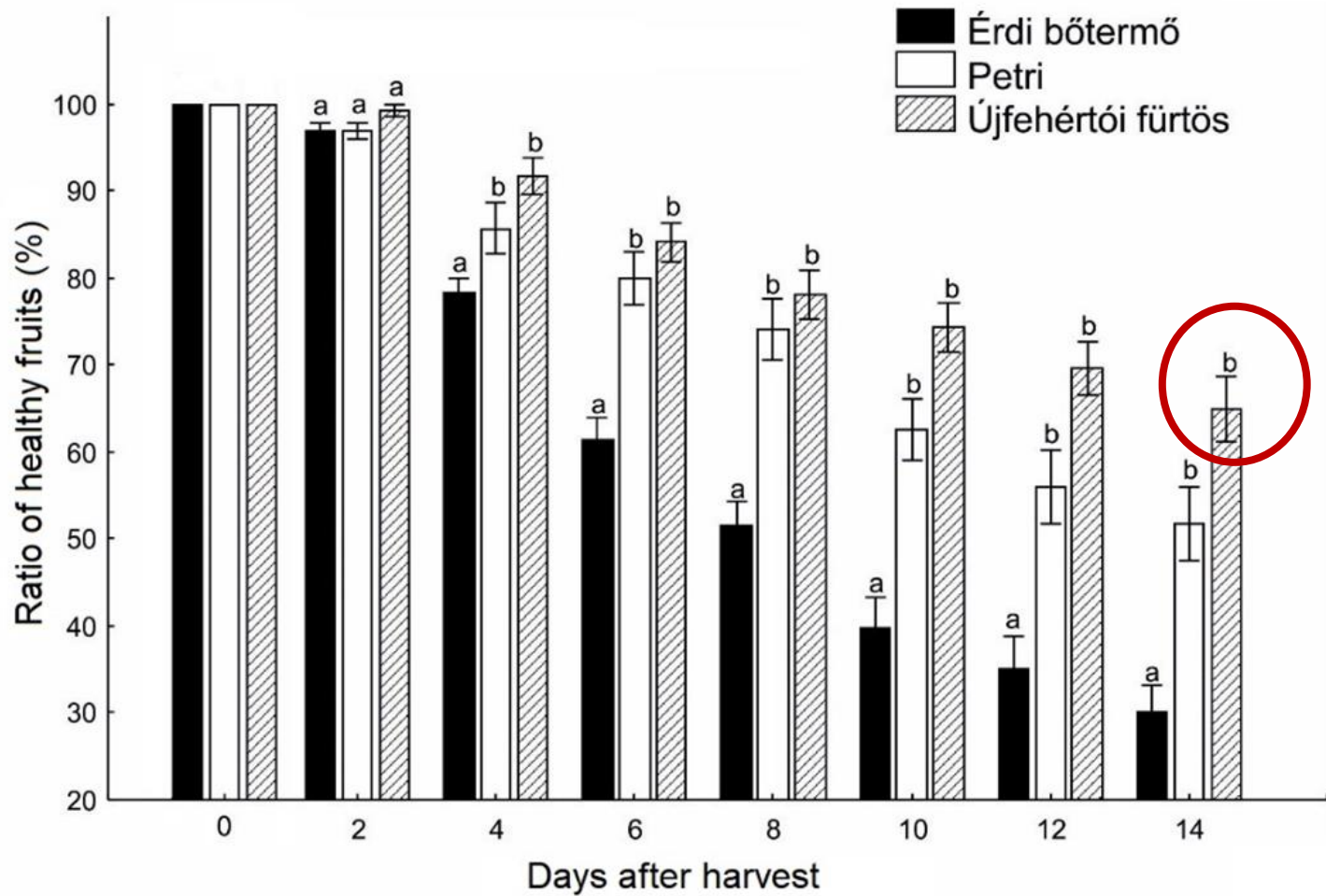
## Statistical analysis

- one-way ANOVA, Bonferroni-test
- Q-Q plots, Levene test
- non-parametric Kruskal-Wallis test
- Mann-Whitney U test
- Analysis was made with Statsoft Statistica ver.7 software.





# RESULTS – SHELF LIFE FOLLOWING HARVEST

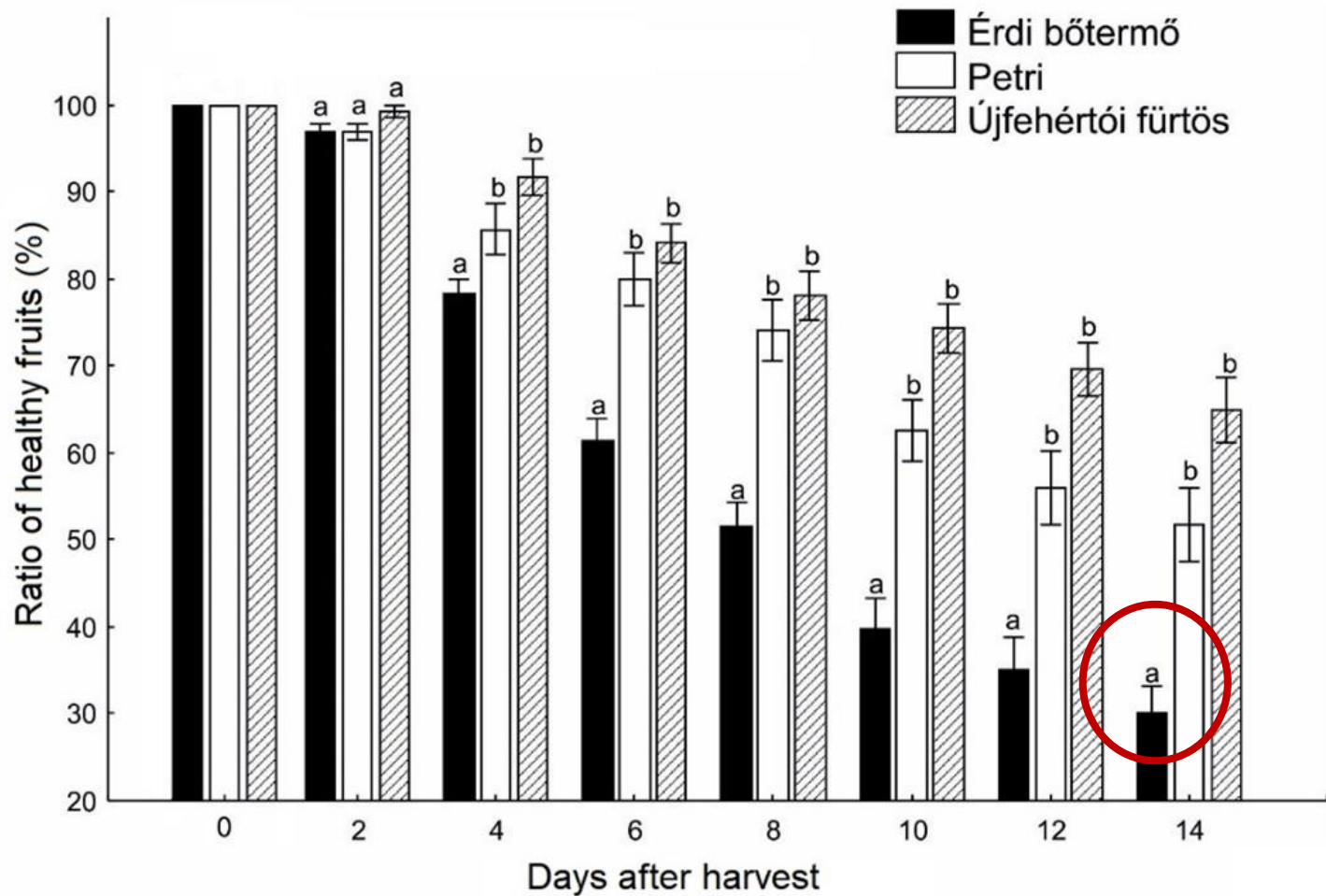


- Different shelf life
- Újfehértói fürtös: 64% (at the 14th day)
- Petri: difference was not significant

Lowercase letters indicate a statistical difference between the three studied cultivars based on the Mann-Whitney U test ( $p < 0.05$ ).

The proportion of healthy fruit ( $\% \pm \text{SE}$ ) of the three sour cherry cultivars, harvested in four consecutive years (2016-2019).

# RESULTS – SHELF LIFE FOLLOWING HARVEST

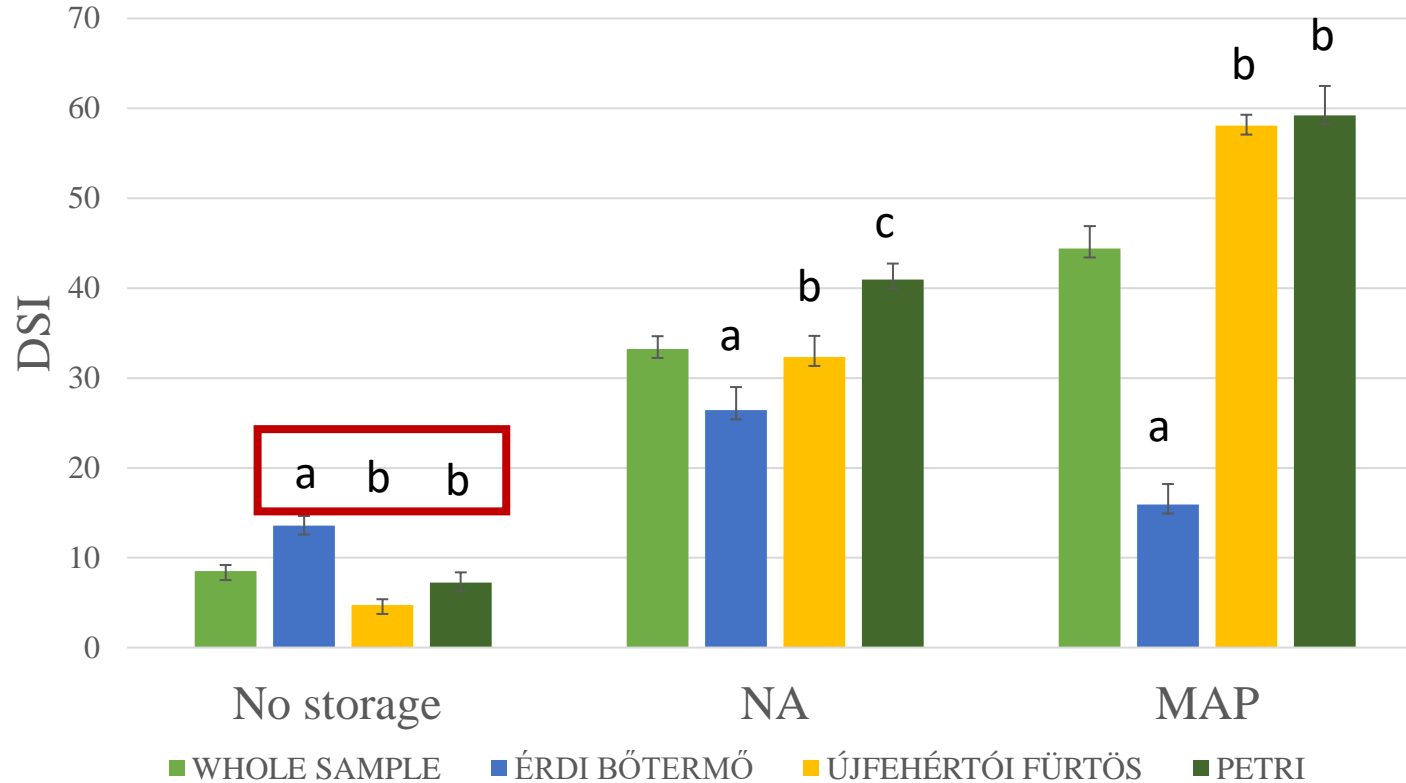


- Different shelf life
- Significantly lower Érdi bőtermő

Lowercase letters indicate a statistical difference between the three studied cultivars based on the Mann-Whitney U test ( $p < 0.05$ ).

The proportion of healthy fruit ( $\% \pm \text{SE}$ ) of the three sour cherry cultivars, harvested in four consecutive years (2016-2019).

# RESULTS – DSI COMPARISON CULTIVAR

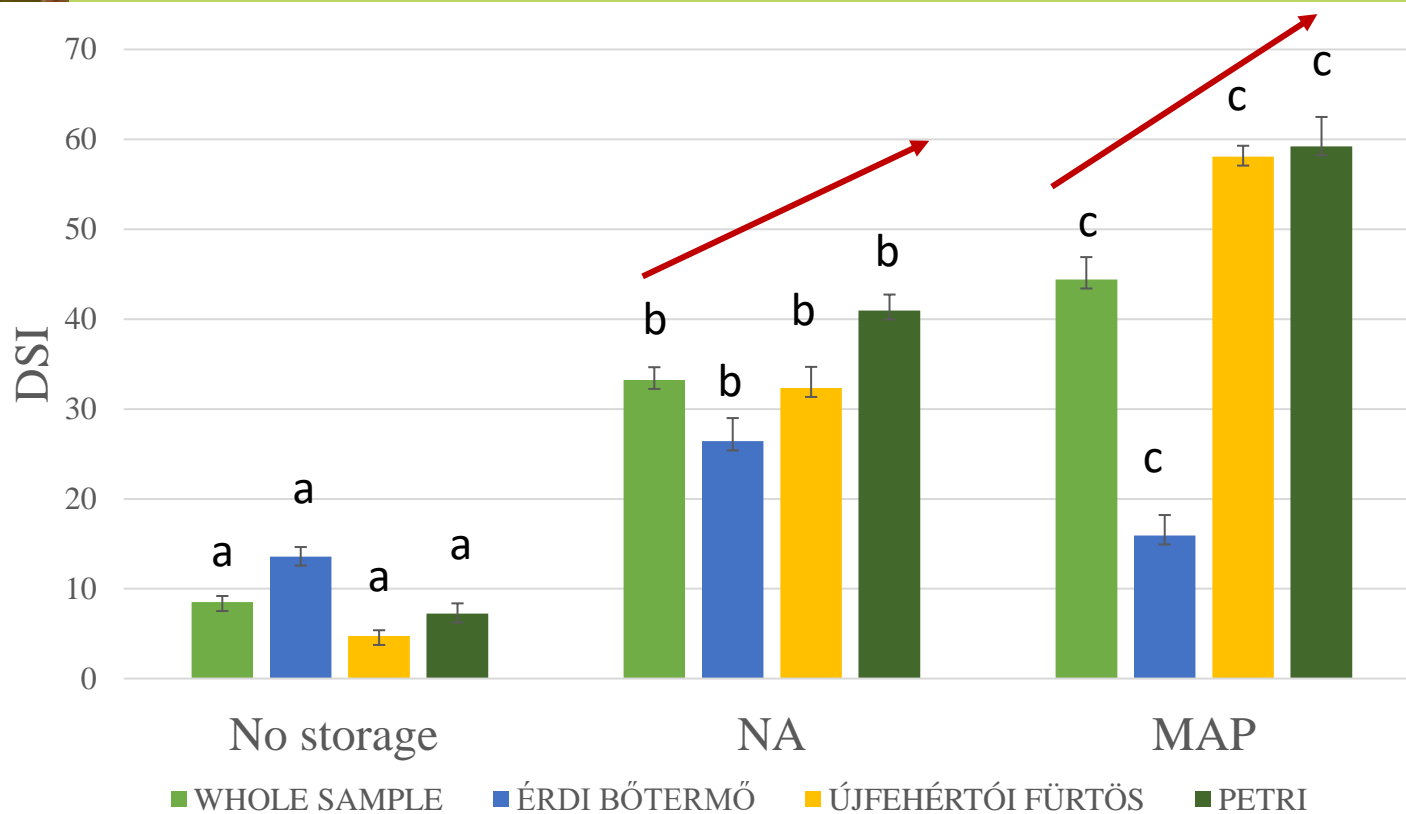


Letters show significant differences between cultivars based on Mann-Whitney U test (p < 0.05).

- 6th day the shelf life study
- After harvest sign. diff.
- Érdi bőtermő highest value

Mean values of disease severity index (DSI) of the whole sample and of the three studied sour-cherry cultivars by storage types. Data set contained all measures of the four-year study (2016-2019).

# RESULTS – DSI COMPARISON STORAGE

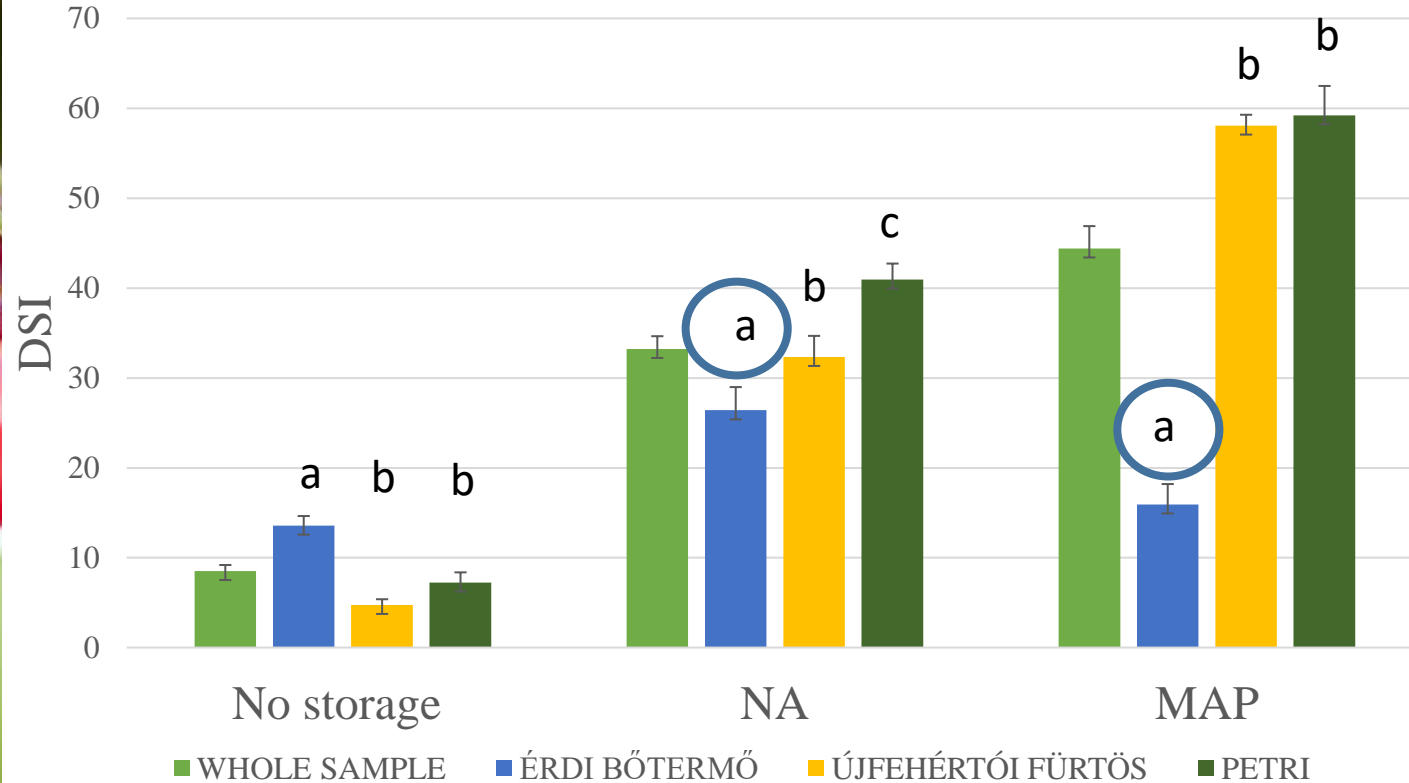


Letters show significant differences between storage types based on Mann-Whitney U test ( $p < 0.05$ ).

- 6th day the shelf life study
- Cold storage in any cases DSI increased sign.

Mean values of disease severity index (DSI) of the whole sample and of the three studied sour-cherry cultivars by storage types. Data set contained all measures of the four-year study (2016-2019).

# RESULTS – DSI COMPARISON CULTIVAR

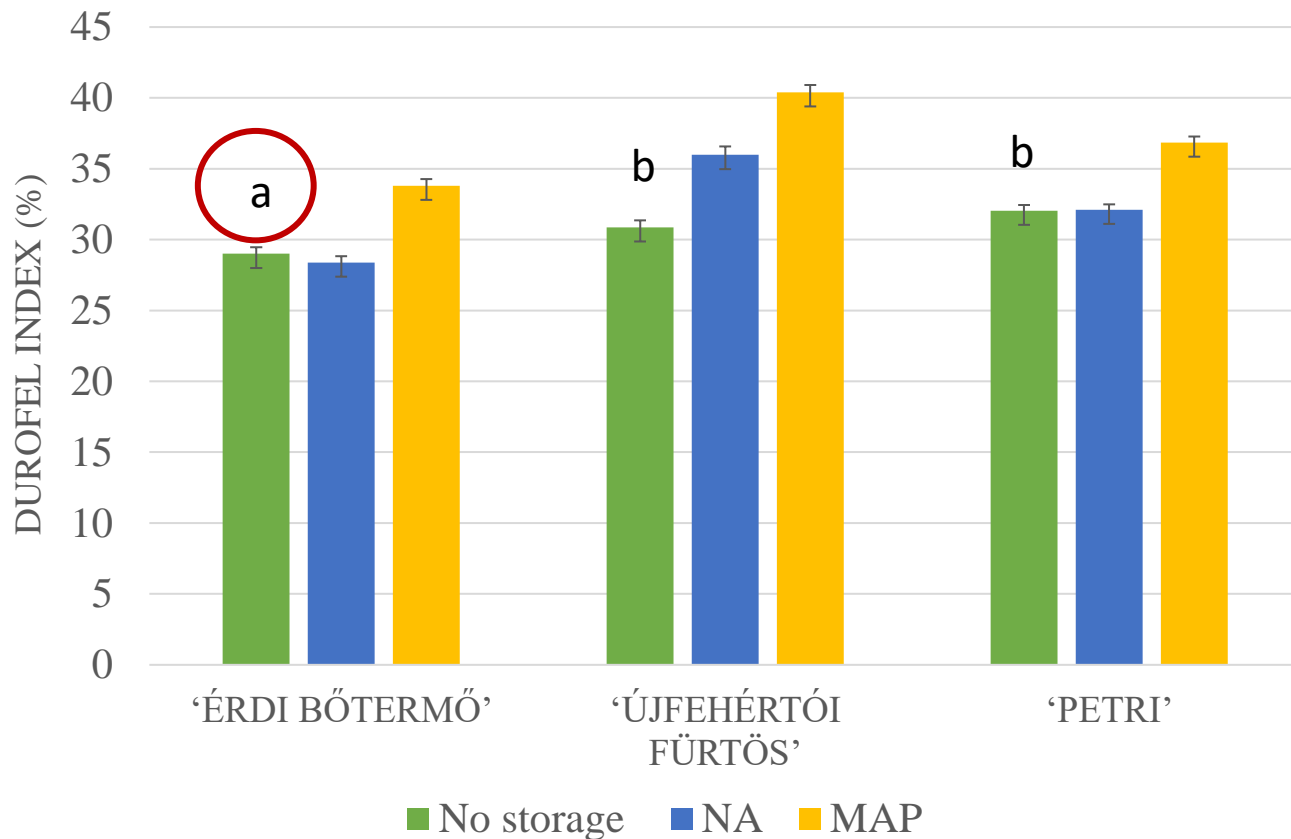


Letters show significant differences between cultivars based on Mann-Whitney U test ( $p < 0.05$ ).

- 6th day the shelf life study
- Compare DSI of cultivars
- Érdi bőtermő best DSI with MAP

Mean values of disease severity index (DSI) of the whole sample and of the three studied sour-cherry cultivars by storage types. Data set contained all measures of the four-year study (2016-2019).

# RESULTS – FRUIT FIRMNESS COMPARISON CULTIVAR

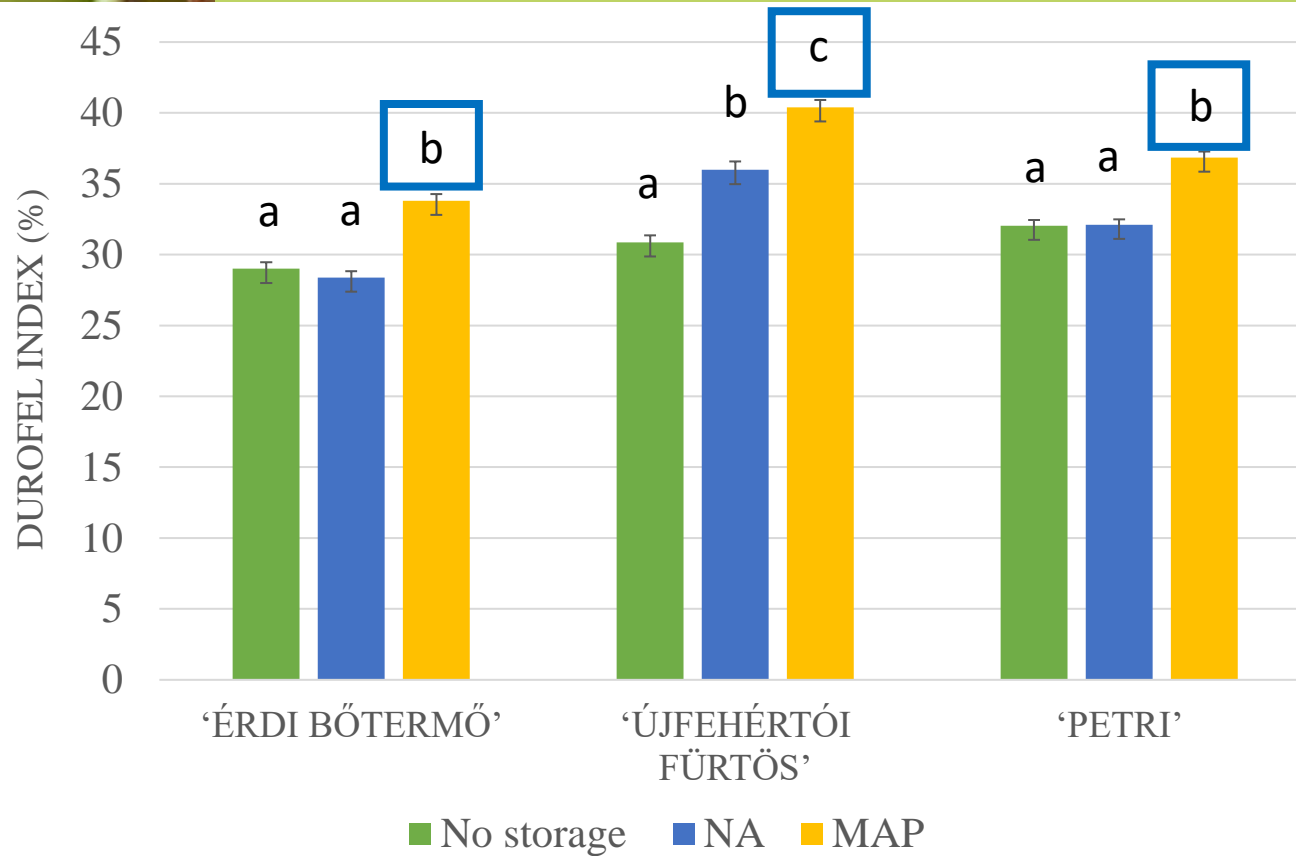


- Significant difference between the cultivars
- Érdi bőtermő the softest

Small letters indicate significant differences between between cultivars (immediately after harvest) based on Bonferroni test (ANOVA) ( $p < 0.05$ ).

Average fruit firmness of the three sour cherry cultivars after harvest, and following six weeks cold storage at normal atmosphere and modified atmosphere packaging, calculated from data of four consecutive years (2016-2019)

# RESULTS – FRUIT FIRMNESS COMPARISON STORAGE

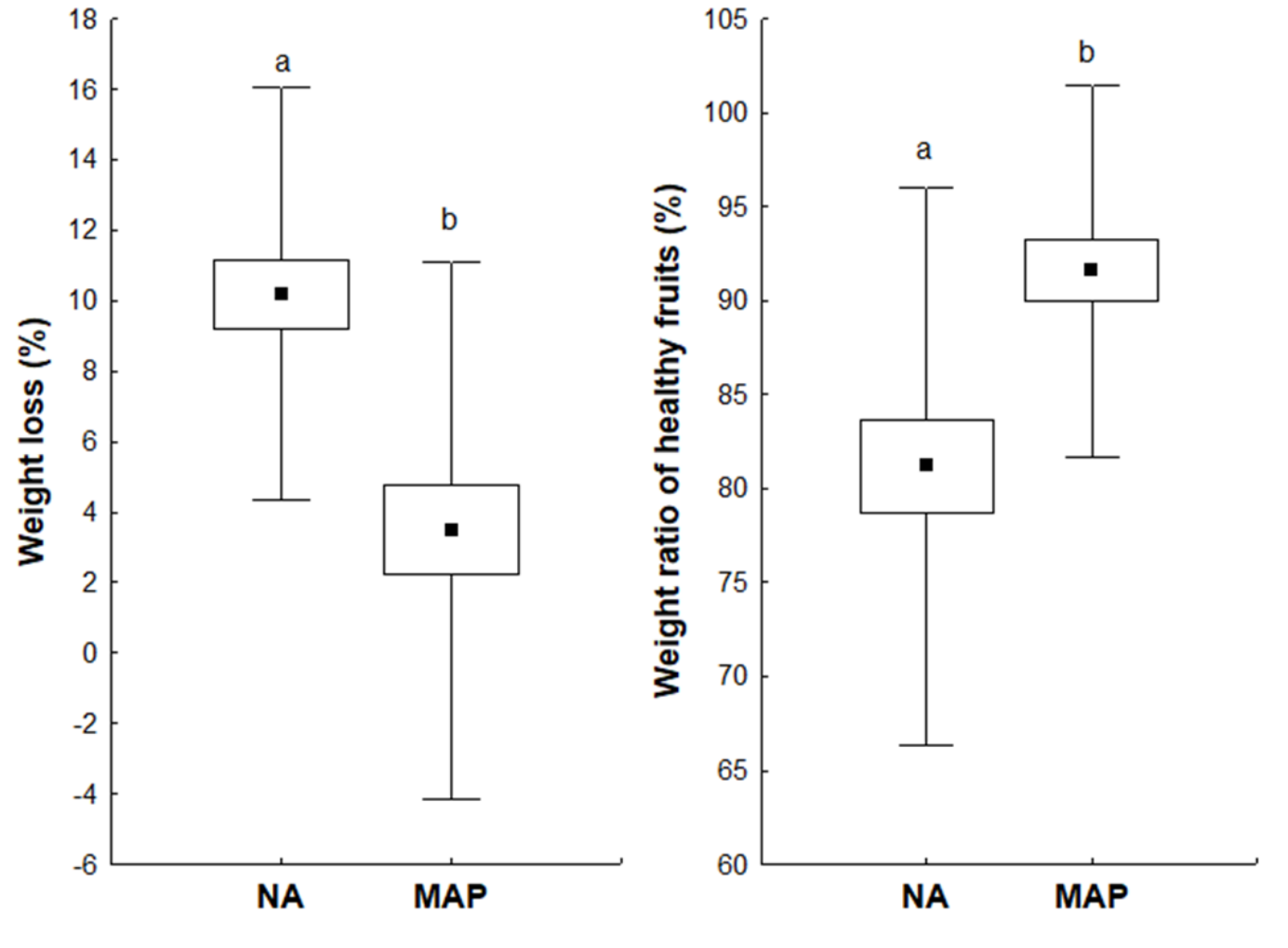


- MAP storage: significantly increased the fruit firmness for all cultivars

Small letters indicate significant differences between storage modes based on Bonferroni test (ANOVA) ( $p < 0.05$ ).

Average fruit firmness of the three sour cherry cultivars after harvest, and following six weeks cold storage at normal atmosphere and modified atmosphere packaging, calculated from data of four consecutive years (2016-2019)

# RESULTS – COMPARISON STORAGE METHOD



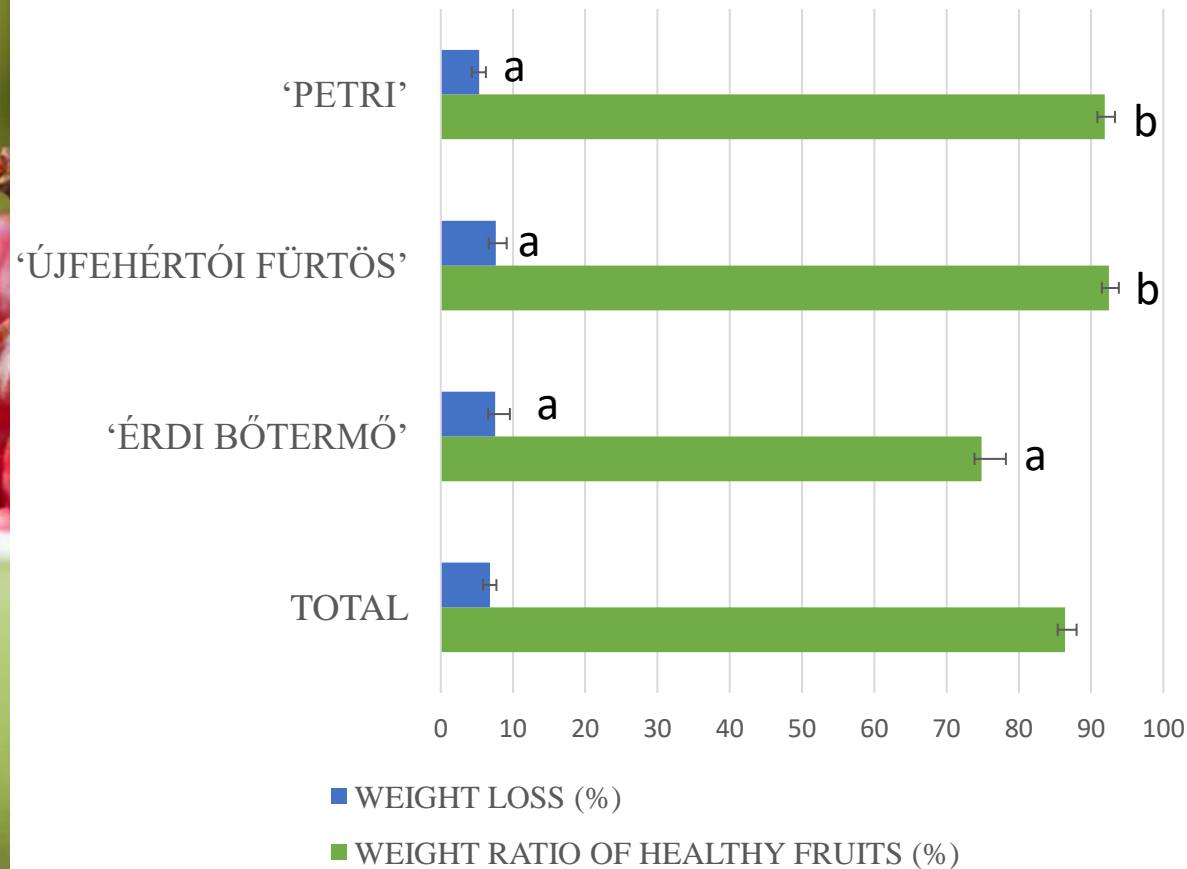
Letters show significant differences based on Mann-Whitney U-test ( $p < 0.05$ ).

- Significantly higher ratio of healthy fruit, and lower weight loss, independently of the cultivar

Mean weight loss (%) and weight ratio of healthy fruits (%) of sour cherry after 42 day cold storage under MAP and NA cold conditions, calculated from data of 2016-2019.



# RESULTS – STORAGE COND. COMPARISON CULTIVARS

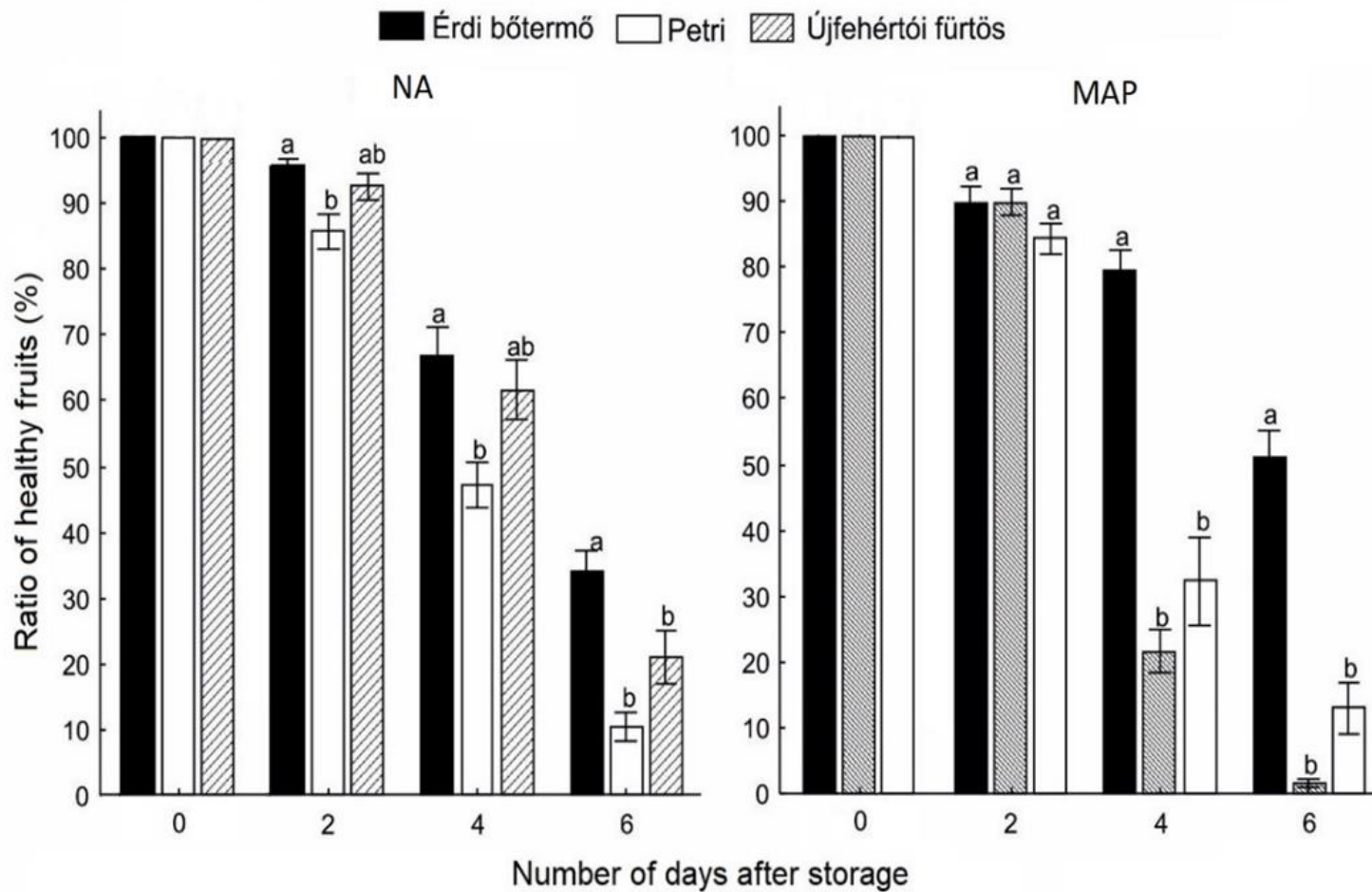


- Significantly less healthy fruit remained: Érdi bőtermő
- Weight loss: no sign. difference

Letters show significant differences between cultivars based on Mann-Whitney U test ( $p < 0.05$ ).

Average ratio of healthy fruit and weight loss after 42 days (average of cold storage under normal atmosphere and MAP) in case of three studied cultivars from four consecutive years (2016-2019).

# RESULTS – SHELF LIFE FOLLOWING COLD STORAGE



- Shelf life was reduced significantly
- Highest proportion of intact fruit: Érdi bőtermő  
MAP storage (51%), NA 34%
- Újfehértói fürtös, Petri: proportion of healthy fruit under 20%

Lowercase letters indicate significant differences between cultivars based on Mann-Whitney U test ( $p < 0.05$ ).

Average ratio of healthy fruit (%; mean /  $\pm$  SE) after six weeks cool storage for the three sour cherry cultivars at normal atmosphere (NA) and modified atmosphere packaging (MAP). Calculated from data of four consecutive years (2016-2019).

# CONCLUSION

- Újfehértói fürtös best shelf life after harvest
- MAP of Xtend® Cherry (StePac LA Ltd.)
  - reduced the weight loss, the percentage of decayed fruit
  - preserved or increased the fruit firmness of the Újfehértói fürtös and Petri sour cherries after the cold storage
- Following cold storage:
  - Érdi bőtermő had significantly lower proportion of intact fruit
  - The shelf life of sour cherry cultivars was shorter
- Best post-storage shelf life values were detected in the case of MAP stored 'Érdi bőtermő' cultivar





**Thank you for your attention!**