Monitoring apple fruit growth & development on the tree using a handheld spectrometer

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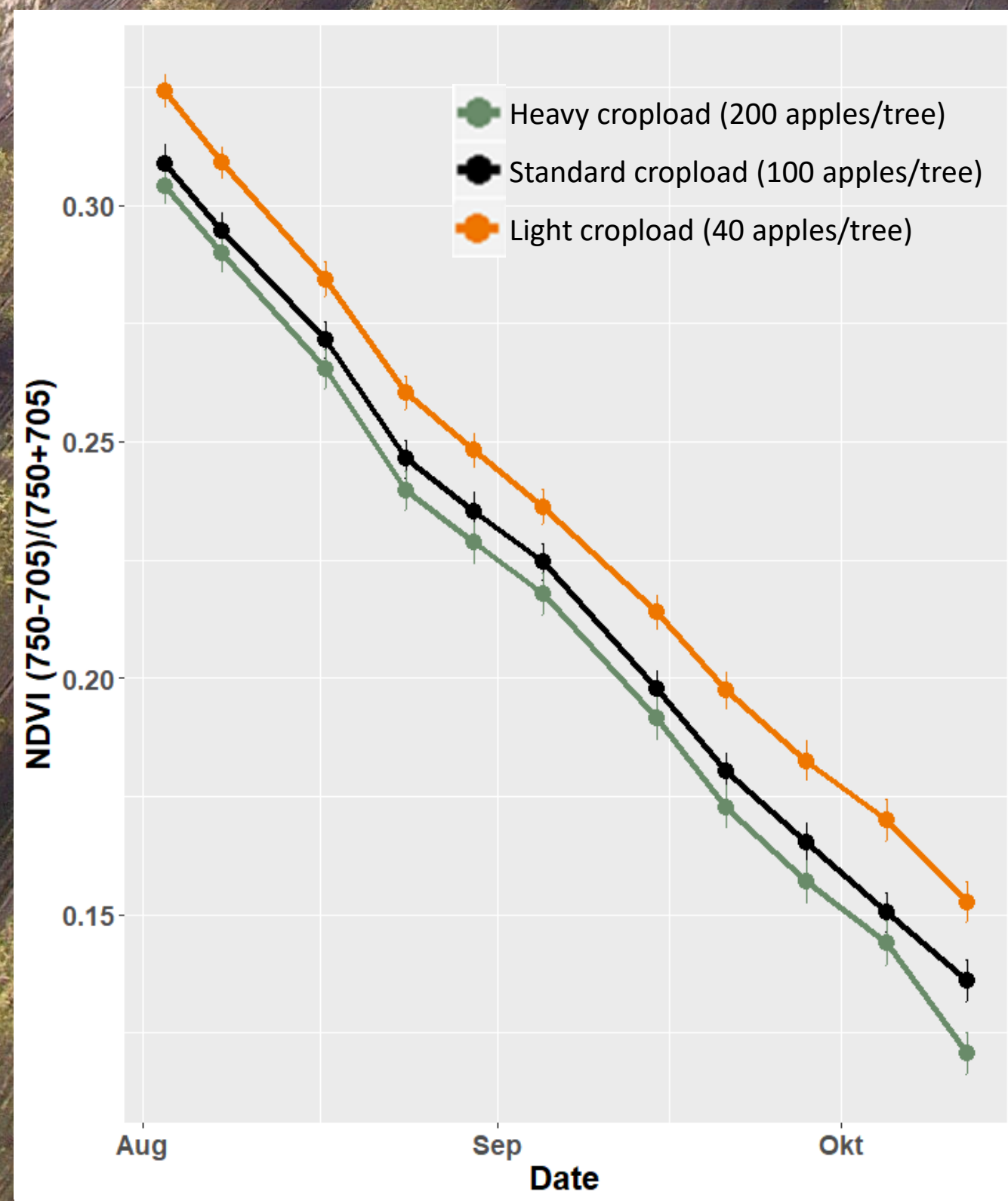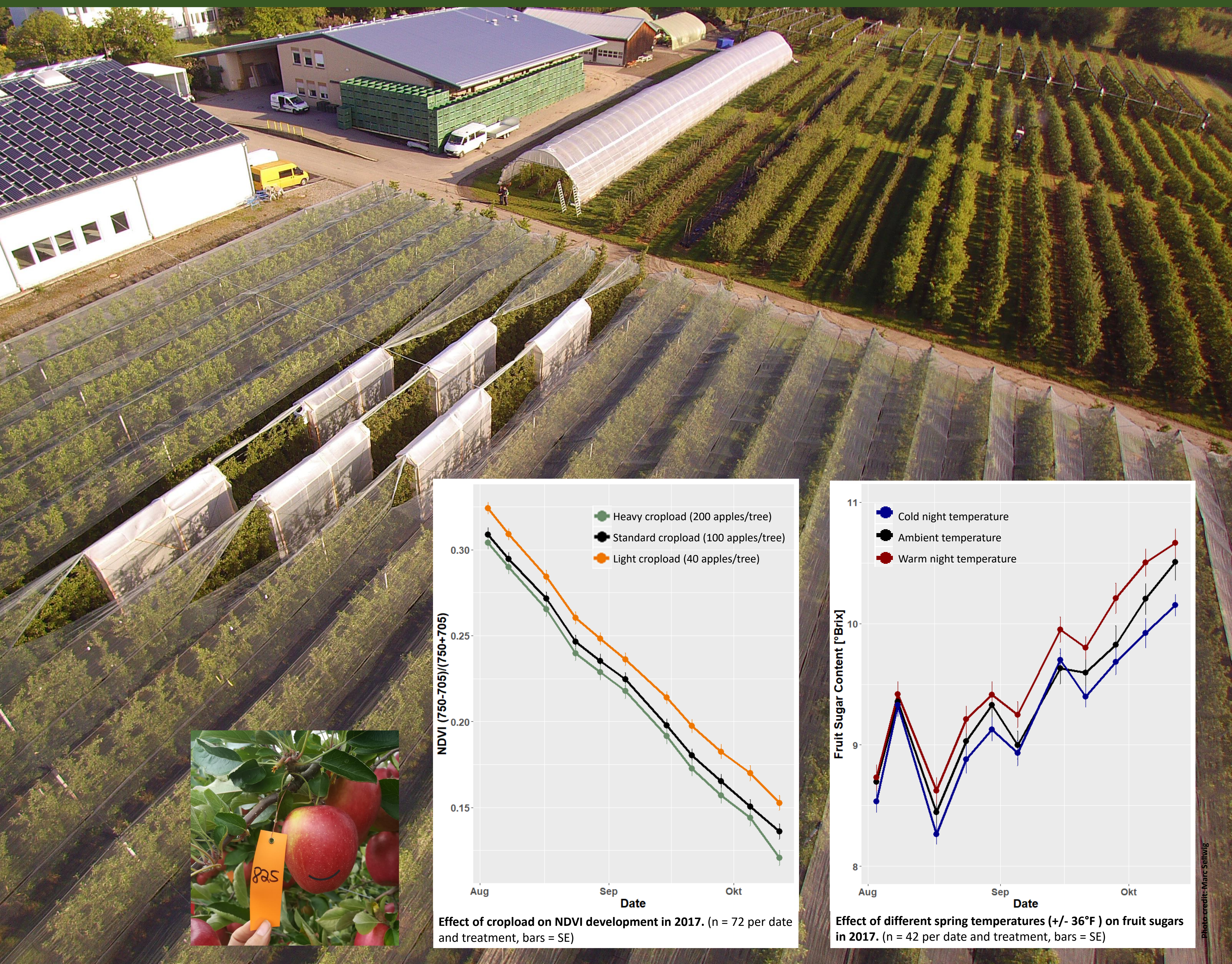
Effect of cropload on NDVI development in 2017. (n = 72 per date and treatment, bars = SE)

Legend:
- Heavy cropload (200 apples/tree)
- Standard cropload (100 apples/tree)
- Light cropload (40 apples/tree)

NDVI (750-705)/(750+705)
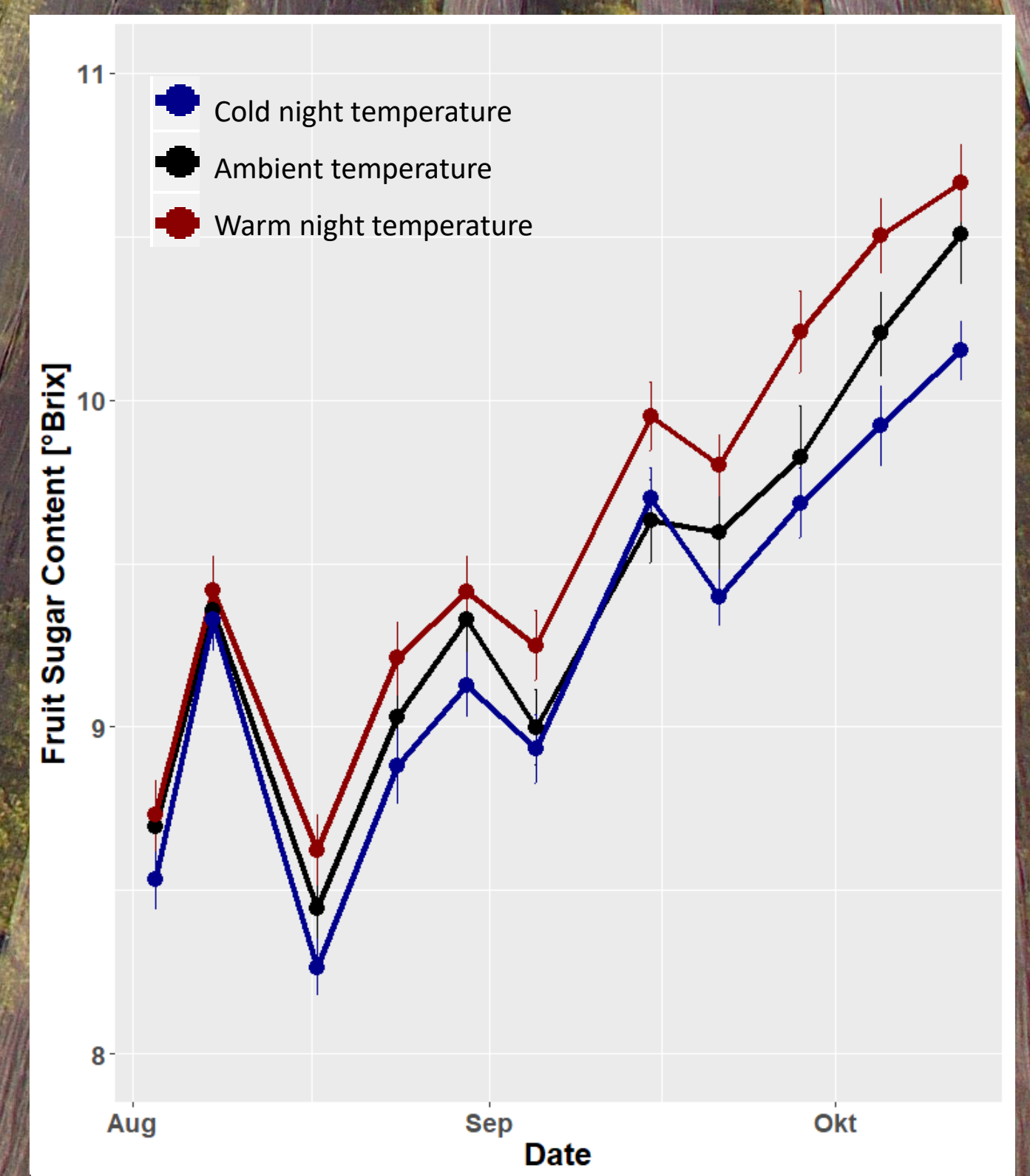
Effect of different spring temperatures (+/- 36°F) on fruit sugars in 2017. (n = 42 per date and treatment, bars = SE)

Legend:
- Cold night temperature
- Ambient temperature
- Warm night temperature

Fruit Sugar Content [°Brix]

Photocredit: Marc Seitoug

Material & Methods

- Field trials (2016-2018) with 'Braeburn' apples in Germany.
- VIS/NIR scans (400-1100 nm) with a F-750 Produce Quality Meter (Felix Instr. Camas, USA).
- Weekly scans on the same fruit position (12 marked fruit per tree – see closeup photo).
- Temperature treatments were generated with plastic bubble tents for three weeks after bloom (see trial overview photo).
- Sugar was calculated with a partial least squares regression model (729-975 nm) using ~200 reference fruit, first scanned at three temperatures & then destructively analysed with a refractometer. Model R^2 = 0.85.

Aim of the study

To determine changes in apple quality parameters with non-destructive technology while fruit grow on the tree.

Conclusions

- NDVI and other non-destructive parameters measured in the field might be future parameters to determine fruit quality.
- Promising first results need to be confirmed in further experiments.

Results & Discussion

- The Normalized Difference Vegetation Index (NDVI) is a good parameter to monitor green pigment changes in the fruit.
- The heavy cropload treatment showed higher NDVI values for 2017 & 2016 (data not shown). Moreover, the same treatment had lower internal fruit storage disorders.
- The non-destructive sugar content graphs show some "bumps" similar to traditional lab samples. An explanation for the large change in early August maybe related to different weather conditions and/or variation in the timing of the destructive reference sampling.

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