
# Grower Summary

## Developing Practical Strategies to Improve Quality and Storability of UK Apples

**TF 225**

Annual report 2017

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| **Project title:** | Developing Practical Strategies to Improve Quality and Storability of UK Apples |
| **Project number:** | TF225 |
| **Project leader:** | Dr Richard Colgan - Natural Resources Institute, University of Greenwich |
| **Report:** | Annual Report October 2017 (for 2016) |
| **Previous report:** | None |
| **Key staff:** | Debbie Rees, Chris Atkinson NRI - University of Greenwich<br>Julien LeCourt - NIAB-EMR<br>Abi Dalton - FAST LLP<br>Mehrdad Mirzaee, Mark Tully, Colin Carter - Landseer |
| **Location of project:** | NIAB/EMR, FAST LLP, Selected Gala orchards in Kent |
| **Industry Representative:** | Nigel Jenner, Paul Smith and Nigel Stewart |
| **Date project commenced:** | 1 April 2016 |
| **Date project completed (or expected completion date):** | 31 March 2021 |

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*The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.*

# GROWER SUMMARY

## Headline

Position of fruit within the tree canopy influences the accumulation of fruit dry matter content.

Fruit with higher dry matter entering storage maintained higher % Brix throughout CA (3% $CO_2$ 2% $O_2$) storage.

Chlorophyll fluorescence may have the potential to track changes in harvest maturity

## Background

Fruit dry matter (FDM) content is considered a good indicator of high sugar and acid content (% $Brix^0$) and eating quality of apples at harvest. Also, apples high in FDM tend to retain quality attributes over extended periods of storage. The extent to which orchard management practices during flower bud and fruit development affects FDM at harvest requires further attention. Moreover, the relationship between FDM and fruit ex-store quality throughout the storage season is of interest to for UK apple industry and may afford the opportunity to identify orchard consignments that can be stored for longer.

Several research groups, including work of Palmer (1999) in New Zealand have linked high dry matter content (FDM) of fruit at harvest to good quality and good storage potential. These studies were reviewed in AHDB-Horticulture (TF 222) and although previous research highlights the potential to use FDM as a proxy measure of fruit quality, much of this work was correlative.

The underlying basis of this relationship needs to be better understood so that it can be manipulated to deliver premium fruit quality. This will be achieved through a combination of a meta-analysis of existing published and unpublished data sets to obtain a greater understanding of the factors controlling both FDM and quality, and the development of practical strategies in terms of novel pruning strategies, reflective mulches and manipulation of crop load through bud and fruit thinning to help growers to improve the quality of stored apples.

## Summary

Meta-analysis (UoG/FAST LLP/NIAB-EMR) for the two years of FDM data for commercial Gala and Braeburn orchards identified 56 Gala orchards where mineral analysis (soil or leaf) existed to allow some correlative analysis FDM against soil and leaf quality attributes. However, the FDM data spread for Gala was only 2.2%, suggesting that identifying a strong

driver for increased FDM would be difficult to determine. Further FDM data from 2016-2017 season may help to strengthen the data set.

Most of WP2 (NIAB-EMR) outputs started in year 2 of the project and fall outside of this reporting period. Conversion of tall spindle trees to a centrifugal growth habit was undertaken in the winter of 2016. The first crop was harvested in September 2017 (year 2). Additional assessment of tree architecture using LIDAR and light interception and thermal imaging assessment of fruit temperature will be reported in year 2 of the project.

In the first year of WP3 (FAST LLP/UoG) identifying difference in fruit position within the canopy found that fruit harvested above 1.5 M were higher in FDM than fruit harvested at ~ 0.6 M in the lower canopy of the tree. There was insufficient difference in FDM between fruits harvested on the North and South aspect of the tree to suggest a difference in light interception between the hours of sunshine captured between morning and afternoon.

Analysis of the different components of FDM (UoG) from post-flowering through to harvest found a rise in the amount of soluble sugars as fruitlets increased and a decrease in the proportion of alcohol insoluble fibre. This suggests that much of the increase in sugar during fruit development was associated with a decrease in cell wall carbohydrate. The proportion of starch content remained relatively constant up to the point of harvest.

Advanced warning of the onset of starch clearance would allow growers more time to organise harvest and increase the likelihood of a greater proportion of the first pick Gala crop being harvested within the short window necessary to ensure fruit are suitable for long term storage. Chlorophyll Fluorescence (CF) (Landseer Ltd) affords an opportunity to provide information to growers regarding changes in fruit maturity in advance of changes in starch clearance patterns. Analysis of chlorophyll fluorescence outputs from six commercial orchards found that on average CF outputs could predict the decrease in starch to 75% content 7-10 days before the event. Further work is ongoing to determine the impact of early warning and potentially more precise harvesting forecasting on the storage quality of fruit.

## Financial Benefits

None to date.

## Action Points

Harvesting fruits high in the canopy separately will provide consignments with higher DM.