Epigenetic control of strawberry secondary metabolism- a small fruit with a complex genome

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Project description:

There is an increasing need to promote the consumption of fresh produce in the UK and world-wide as it is associated with a protective role against several types of cancer and cardiovascular diseases. However, soft fruit such as strawberries have a very short shelf-life after harvest resulting in reduced nutritional value to the consumer and in substantial waste. Central to the health-promoting properties as well as to the flavour and aroma of strawberries are the secondary metabolites produced in the fruit. This cocktail of small molecules is unique for all strawberry varieties, and changes during fruit ripening pre and post-harvest. Accordingly, the biosynthesis genes encoding the diverse metabolic pathways are dynamically regulated. This project will investigate the regulation of secondary metabolism in strawberry fruit at an epigenetic level. Firstly, unlike model plants, many commercial crops have complex polyploid genomes. Commercial strawberries (Fragaria ananassa) have octoploid genomes, so we need to understand how interactions between the component genomes are regulated. Secondly, it has been recently discovered that many metabolic pathway genes are organised in clusters of neighbouring genes and are regulated by changes in chromatin configuration. In preliminary expression and metabolite experiments, we have identified several metabolic pathway genes and small molecules that are regulated in commercial strawberry post-harvest. Now, we propose to analyse the contribution of the separate genomes of F. ananassa to this expression pattern and compare it to the transcription in a simpler diploid wild relative, F. vesca, using RNAseq to analyse global changes in gene expression followed by more detailed targeted analyses using real time PCR. This will lead on to investigating the epigenetic control of gene expression in the commercial strawberry using techniques such as chromatin immunoprecipitation. Our long- term aim is to identify processes and gene targets of use to plant breeders. We have therefore made links with a strawberry breeder and grower who will provide the student with further insights into the commercial priorities for optimising fruit quality and how to integrate results from the project into breeding programmes.