Physical Fruit

Project Aim

To increase the availability of sustainably-grown UK soft fruits requiring reduced inputs through the understanding and utilisation of physical traits for pest and disease resistance, leading to wealth creation, support for rural economies and health benefits.

Background

The fruit industry relies on a small number of varieties generally bred for fruit quality, and also on a decreasing number of chemicals for pest and disease control (91/414 EEC). This presents serious challenges for the future, as few suitable high quality varieties with innate resistance to major pests and diseases are available to growers and good fruit quality, rather than host plant resistance, continues to be the main focus for the commercial fruit breeding and processing companies.

Plants with physical resistance traits to pests and diseases exploit morphological structures or biomechanical characteristics that interfere with pest/pathogen movement, host recognition, feeding, or reproduction on or in the plant. These features can make the plant less attractive visually, or present formidable physical barriers to pests and diseases.

It is becoming increasingly recognized that such physical plant traits are remarkably effective against pests and diseases, often more so than defensive chemistry.

Utilizing physical traits

However, breeding for physical resistance traits in crops has not been fully capitalized upon, despite the potential advantages of this approach compared to chemical resistance traits such as anti-feedants and toxins. Part of the reason for the under-exploitation of physical resistance traits in crops is that the genetic basis for these resistance traits is often poorly characterized.

This programme of work aims to investigate four key traits; (1) root architecture and morphology, (2) leaf trichomes, (3) cane/stem architecture and (4) plant habit, to determine how variation in these traits contributes to resistance against pest and diseases in the soft fruit crops raspberry, blackcurrant and blueberry.

The project will use raspberry as a model crop to identify the main chromosomal regions (QTLs) controlling these traits, identify and map BAC clones (large DNA sequences) into these regions and determine the gene content. This will allow us to understand the genetic basis of physical trait resistance and so utilize the information through molecular approaches in breeding programmes.

Who is involved in the project?

The academic partners are the James Hutton Institute and ADAS. The industrial partners are KG Growers Ltd, GlaxoSmithkline, Redeva, Adamston Farms, Leaf, Thomas Thomson (Blairgowrie) Ltd, Marks and Spencers. The project is managed by and lead by Mylnefield Research Services Ltd.

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