

# Apple breeding at East Malling Research

By Dr Kate Evans

## Current breeding work / technologies

East Malling Research (EMR) is the principal UK provider of top-class basic, strategic and applied horticultural research and development for the perennial crops sector. Launched in 2004, EMR builds on a 90-year history and world-class reputation for revolutionary research in this field.

Apple breeding at East Malling Research was directed traditionally towards satisfying the needs of the UK industry, an industry that on the dessert side had become almost a monoculture of Cox's Orange Pippin. Consequently, the breeding objectives have concentrated on 'Cox-type' apples or varieties that fit around the ever-extending Cox season. More recently, with UK and overseas funding for the formation of the [East Malling Apple & Pear Breeding Club](#), the objectives have been extended to breeding a wide range of different varieties to satisfy the needs of growers and markets worldwide, using varieties such as Gala, Fuji and Braeburn as parents in the crossing programme.

Any new variety must produce high quality apples whilst requiring low inputs from the grower; thus precocity (how soon a new tree starts to bear fruit after planting), high yield, improved storage, and resistance to pests and diseases are all important goals. Whilst there is increasing interest in pest and disease resistant varieties for their environmental benefits, fruit quality, precocity and yield remain of great importance.



Apple cordons at East Malling Research

Currently, the breeding programme produces around 15,000 to 17,000 seeds per year. Once germinated, the seedlings go through various rounds of selection, first in the glasshouse and later in the field, to discard individuals with poor characteristics. By the time the seedlings are budded onto rootstocks, 18 months from germination, there are usually only around 1,500 maximum that

have passed successfully through the selection programme. These are then planted as cordons (to reduce plot size) ready for fruit assessment in years 5 and 6 (where year 1 is germination).

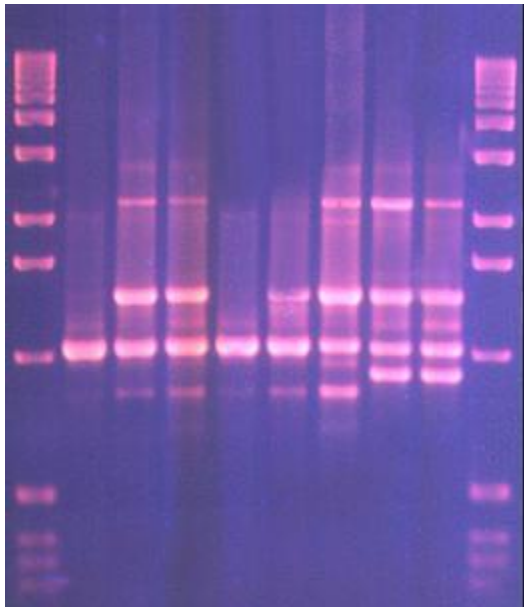
Fruit with good appearance is harvested for further assessment including a period of CA storage and shelf-life tests. The Head-Licenseses of the Breeding Club then take the selections into trialling.

## Recent releases

The latest apple release from the Apple & Pear Breeding Club is [Meridian](#), the result of a cross between Falstaff and Cox's Orange Pippin. Meridian fruits are striped orange-red with a green/yellow background colour. They are juicy, moderately firm with good texture and an excellent aromatic flavour, ranking highly in taste panel assessments. Meridian trees produce higher Class I yields than Queen Cox and in some seasons can be ready for harvest up to ten days earlier. Meridian has the advantage of eating very well straight from the tree and also after storage in air (3.5C) until January.

[Saturn](#) was released from the Club in 1997 as a new disease resistant variety. It has a good level of resistance to scab, derived from parent PRI 1235, and tolerance to mildew and good fruit quality derived from Starkspur Golden Delicious. Saturn is precocious and heavy cropping producing predominantly blushed red fruit with excellent skin finish. The flesh is very juicy and crisp with a pleasant sweet flavour with a moderate hint of acidity.

## Developing further techniques



Molecular markers

Defra funding over the last few years has been focussed on developing the technique of marker-assisted selection in a high-throughput system that will be applied to the apple scion and rootstock breeding programme. Molecular markers are easily-identifiable bits of DNA that are tightly linked to genes of interest, for example those involved in disease resistance or fruit quality, and can be used to test for these characteristics in seeds or seedlings. Thus, at a very early stage in the breeding programme, individuals lacking the required characteristics can be identified and discarded (marker-assisted selection). Multiple markers can be tested simultaneously enabling the breeder to test many thousands of individuals for a wide range of characteristics. The rapid identification of individuals likely to have good fruit quality characteristics using marker-assisted selection is particularly useful when working with crops such as apple which can take several years to outgrow juvenility and produce fruit. Molecular markers also enable breeders to identify individuals that have more than one gene for resistance to a particular disease, which is extremely important in producing a durable form of resistance.

Of course, the technique relies on sufficient markers being identified that are linked to important characteristics. The application of marker-assisted selection should improve the efficiency of the programme allowing the breeder to be much more specific about the characteristics for selection or rejection. The ranking of importance of the selection criteria will be determined in collaboration with the members of the Apple & Breeding Club. Thus it should become possible to produce apples that are 'tailored' to a variety of different global needs including taste, appearance, climate, resistance and season.

We would like to thank Dr Kate Evans for this article.  
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