

HDC PROJECT TF 121 (HORTLINK PROJECT HL0150LOF)

VARIETIES AND INTEGRATED PEST AND DISEASE MANAGEMENT FOR ORGANIC APPLE PRODUCTION

ACTION POINTS FOR GROWERS ON THE SELECTION OF VARIETIES (from final report - August 2005)

When selecting suitable dessert apple varieties for organic production specifically for volume sales through the multiple retailers in the UK, the chosen variety/ies should have a combination of the following attributes (in order of priority):

- 1) A good balance of fruit quality characteristics (e.g. colour, shape, firmness, juiciness, crispness, flavour).
- 2) Resistance or tolerance to scab, and also preferably to mildew.
- 3) No great sensitivity to important apple pests, particularly those for which no satisfactory control measure exists under organic protocols.
- 4) No great sensitivity to other apple pathogens, such as canker (*Nectria galligena*).
- 5) Ability to yield precociously, productively and consistently, with well-size fruit (>60mm diameter).
- 6) Suitability for short or long term fruit storage (depending on season).

Identification of suitable varieties from the project

Over 150 disease resistant or promising apple varieties were evaluated for their suitability for organic production in the UK during the project from 2000-2004. This was achieved primarily by screening apples for eating quality through a series of evaluations involving consortium partners including Waitrose and Sainsbury's. Identifying varieties acceptable to UK consumers was the most important component of the work. A short-list of 28 promising varieties were also evaluated for their performance in an organically managed trial orchard, where records of pest and disease susceptibility and agronomic performance were taken.

Recommended dessert varieties

The varieties Ceeval (early season), Rajka, Resi, Rubinola and Rubinstep (mid season) were identified as the most promising dessert varieties for organic production after 4 years of evaluation. They were deemed the best varieties in terms of eating quality and likely consumer acceptance. In addition, each also has a reputed resistance or tolerance to scab (*Venturia inaequalis*), although mildew is likely to remain a problem on all varieties. Key points for each variety are listed below. Full details can be found in Appendix 4 of the final project report (variety database).

Ceeval (Red Alkmene / Red Windsor)

This is a highly coloured clone of Alkmene (Early Windsor) with many Cox attributes. Harvest is from early September (same season as Worcester). Fruit ripening can be erratic so trees may need picking-over several times and fruit size can be variable (thinning is advised). Fruit quality is very good but fruits should be marketed within several weeks of harvest (short-term storage only). Trees show a good tolerance of scab, although fruit scab may occur in high scab risk years. Reputed resistance to

mildew – although our trials have not found this to be the case. Cropping is heavy, although trees may crop lightly during early years.

Rajka

A relatively new, disease resistant apple variety from Czech Republic. Rajka is a mid-season variety (harvest mid-September) with a relatively short storage life (4 months max in air and CA). Fruits have a very good flavour, but a tendency towards greasiness if over-mature. The variety is scab resistant with a good tolerance of mildew. Rajka is easy to grow, with a vigorous, free-spurring habit, suitable for most rootstocks, and is a good pollinator for other varieties.

Resi

A scab resistant variety from the Dresden-Pillnitz breeding programme in Germany, also with some tolerance of mildew. Resi is a mid-season variety and stores reasonably well although has a tendency to develop soft scald if stored below temperatures of 2°C (more work needs to be done to modify the CA regime). Fruits are Gala-like in appearance, very attractive, with a dense, crisp flesh and high juice levels. Fruits are produced on long stalks. Tends to over-crop with small fruits, so thinning is essential to maintain good fruit size. Trees are precocious, vigorous and productive. A very good pollinator for other varieties.

Rubinola

A high-quality mid season dessert variety from Czech Republic. Rubinola has reputed scab resistance and a high tolerance of mildew, but appears susceptible to canker and has been noted to suffer from leaf spot (*Phoma*) on fruits. Eating quality is excellent. Fruits are extremely crisp, juicy with a moderately acid flavour and excellent storage potential (post Christmas). Tends to become greasy-skinned if over-mature, but this does not affect eating quality. Fruits are very attractive – large, flat-round with 70% top red colour over orange/yellow background. Tree performance has been variable in trials at EMR but the variety is reputed to be vigorous, requiring a rootstock weaker than M9 to curb its vigorous growth. Can be inclined to tip-bearing fruiting habit.

Rubinstep

Another variety from the Czech Republic with polygenic scab resistance, although the variety does appear to be prone to rosy apple aphid. Similar to Rubinola, fruits have excellent eating and visual quality and excellent storage potential (post Christmas). Fruits are very crisp and well flavoured. Some russet may be present around the stalk end. Trees are reputed to be extremely vigorous and a dwarfing rootstock such as M27 and M9 may need to be used to curb vigour. Cropping is moderate – thinning not usually required. Trees can be slow to come into bearing.

Recommended culinary varieties

During the project, over 30 varieties of culinary apple (initially selected on the basis of having some merit for organic production) were evaluated for their potential for processing, by staff from Fourayes Farms. Only those varieties which had good fruit quality for pie-making and were of sufficient size to be handled efficiently by industrial peelers and slicers were short-listed as acceptable. Visual quality (for potential fresh sales) was also assessed by staff from Sainsbury's and Waitrose.

The varieties Edward V11, Encore, Howgate Wonder and Pikant were identified as the most promising culinary varieties for organic production after 4 years of evaluation. They were deemed the best varieties in terms of processing / cooking

quality and likely consumer acceptance as an alternative to Bramley when used in fresh sales, provided not too much top (red) colour is present. The varieties Edward VII, Encore and Pikant also have a reputed resistance or tolerance to scab (*Venturia inaequalis*), although mildew is likely to remain a problem. In contrast, Howgate Wonder has reputed resistance to mildew, but may suffer from scab. Key points for each variety are listed below. Full details can be found in Appendix 4 of the final project report (variety database).

Edward VII

A late-season culinary apple, similar in colour and shape to Bramley, although with more of an orange flush over green background. Breaks down to a creamy puree when cooked. Good resistance to scab, although may suffer from bitter pit. Flesh is firm but rather coarse textured, juicy and acidic (although not as acidic as Bramley). Cooking and processing quality is good. Trees can be rather slow to come into bearing and may be difficult to crop in some situations. Trees are compact in habit and hardy, but very late flowering. Storage life is reputed to be good, although scald can be a problem at some temperatures.

Encore

A scab resistant, late-very late season culinary apple with a brownish-red flush over blotchy green background. Fruits can be very large. Flesh is high quality – juicy and subacid with a rather coarse texture and rich flavour. Remains intact when cooked. Cropping is good and the trees are moderately vigorous, spurring freely. Storage is short-term only (2 months in air and CA).

Howgate Wonder

A late season culinary apple with reputed resistance to mildew and a very high tolerance of frost. One of the largest cooking apples in cultivation. Brownish-red flush over most of the skin surface with broad broken stripes of dark red or scarlet. Flesh is very firm and fine-textured, becomes sweeter in storage. Cooks well and breaks up almost completely. Cropping is heavy and regular when fully established. Stores well but becomes very greasy.

Pikant

A new dual-purpose mid season apple from the Dresden-Pillnitz breeding programme in Germany. Produces very large sized fruits with a solid red flush (50-90%) over yellow background. Good sugar-acid balance. Flesh is firm and crisp and well-flavoured with a good sugar-acid balance, suitable for processing. Trees are vigorous and productive, requiring dwarfing to medium vigour rootstocks. Cropping is heavy but fruit size and ripening can be variable so thinning is usually required so maximise fruit size. Fruits can be stored until Christmas in air and until Jan/Feb in CA. Only slight susceptibility to scab and mildew.

Juicing varieties

The French variety Judeline, a highly disease resistant and productive cultivar which produces fruits of high juice content with a good sugar – acid balance, was initially selected as having potential for juicing. However, further trials revealed that the variety has an extremely limited storage life, and is therefore not likely to be acceptable for large-scale commercial juice production. It is likely that varieties which express a good volume of juice (e.g. Red Falstaff and Fiesta) and which are less susceptible to the diseases scab and mildew will continue to fill the organic juice market.

Pest and disease resistance

The variety trial VF216, planted with 28 promising varieties selected by Sainsbury's and Waitrose during the first two years of the project has proved that it is very difficult to select varieties with complete resistance to both scab and mildew and reputed genetic resistance to disease cannot be solely relied on to protect the variety from infection. Varieties with polygenic (multi-gene) resistance to scab are more favourable than single gene (*Vf*) types, but even this cannot guarantee immunity to some scab races, which can overcome resistance. Mildew was an acute problem for many of the varieties on VF216 and was apparent in the orchard right from planting. Few varieties are resistant. The fungus was particularly crippling to young trees during establishment, resulting in weak, distorted growth and failure of the trees to grow well. Scab took slightly longer to progress into the new variety planting and was most likely hampered by the mix of varieties with varying degrees of resistance.

Resistance or tolerance to common pests such as rosy apple aphid is a desirable trait for organic production, but cannot be relied on to provide an effective threshold to infestation in years of heavy pest pressure.

It is highly recommended that, where varieties are selected for organic production, pest and disease resistance or tolerance should be regarded as an extremely important component, but should not be relied upon wholly as a guarantee of immunity. Ideally resistant / tolerant varieties should be used in conjunction with a suitable preventive spray programme of permitted plant protection products in order to provide effective control in years of heavy pest or disease pressure.

Planting a new orchard

When planting a new orchard, it is essential to start off with strong, robust trees on a semi-vigorous rootstock (e.g. MM106) which can compete successfully with the orchard sward. The project has shown that the use of young bench-grafted trees planted too early straight into a grass sward is likely to lead to tree losses and failure to establish well due to competition for water and nutrients. It is essential to consider methods of weed control during tree establishment to allow the trees to receive the best possible start.