

# New developments in the Scottish raspberry breeding programme

 CLIMAFRUIT  
Future-proofing berryfruit

The Interreg IVB  
North Sea Region  
Programme



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The James  
**Hutton**  
Institute

## Breeding Programme 2011

- Release of new cultivars ‘Glen Ericht’ and ‘Glen Cally’ for processing
- Evaluation of advanced selections
  - JHI and on-farm trials
  - New selections
- Deployment of molecular markers

# 2011 Season at JHI

- Crossing programme 2011
- Breeding plot evaluation:
  - JHI Protected cropping system.
    - 20 genotypes in 2 reps (3<sup>rd</sup> season)
    - 30 genotypes in 2 reps (2<sup>nd</sup> season)
    - 30 genotypes in 2 reps (1<sup>st</sup> season)
  - 4000 seedlings from 2008 crossing programme
  - Primocane-fruiting selections
- Selection evaluation in Huelva trials
- New selections to be planted on-farm trials
- Micropropagation of new selections for on-farm trials
- HDC Raspberry trial SF41c, Oxfordshire
- 10<sup>th</sup> International *Rubus* and *Ribes* Symposium, Serbia



# Breeding objectives



- UK Raspberry Breeding Consortium 2009-2014
- Select cultivars suitable for fresh and processing markets
- Development of new primocane-fruiting cultivars
- New hybrids with improved P&D resistance, especially to *Phytophthora* root rot
- Deployment of marker assisted selection strategies
- Evaluation of promising material under commercial conditions in grower trials

# New *Phytophthora*-tolerant cultivars for processing



## Glen Cally

- Tested as 99111A1
- Small firm fruit
- Poor eating quality, acid
- Very upright cane habit
- Machine harvestable
- Susceptible to RBDV

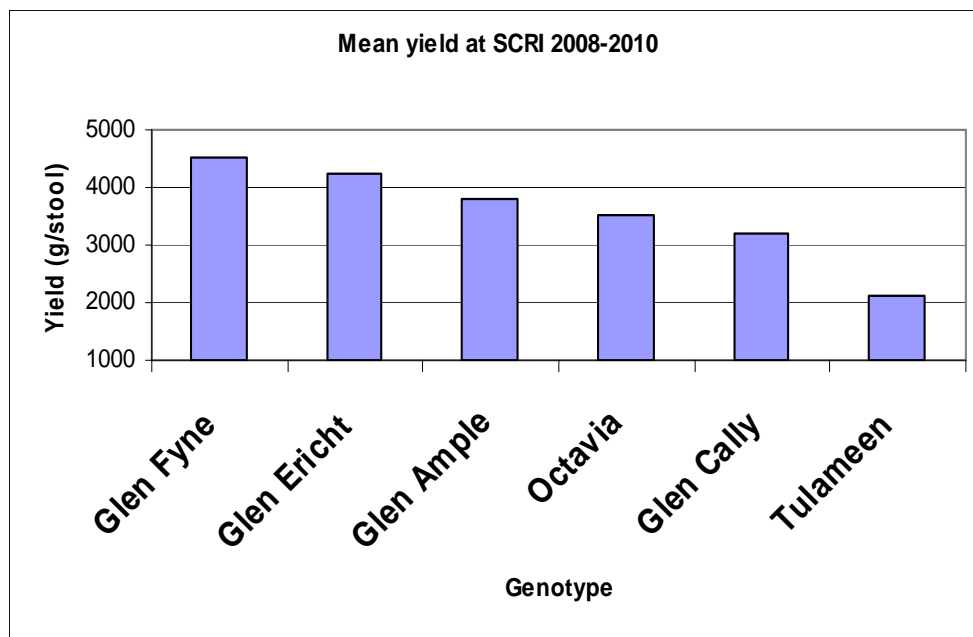
## Glen Ericht

- Tested as 99111B2
- Larger meaty fruit
- Good quality but poor eating quality, v acid
- Very upright cane habit
- Machine harvestable
- Free of RBDV and midge blight



Glen  
Ericht

# Glen Ericht and Glen Cally: Data from SCRI field plots 2008-2010



Genotype	Mean Brix <sup>o</sup>	Fruit size (g)
Glen Ericht	9.4	4.9
Glen Cally	8.6	4.6
Glen Fyne	10.4	5.0
Glen Ample	9.2	5.4
Octavia	9.4	5.8
Tulameen	12.2	5.1



# Glen Fyne

## At JHI

- Consistently more productive than Glen Ample
- Superb sweet raspberry flavour
- Large fruit with good shelf life
- Good machine harvest-ability
- Suitable for fresh and processing markets
- Susceptible to RBDV

## On-farm trials

- Good yield, flavour and quality
- Susceptible to *Phytophthora* root rot



	Mean fruit size (g)	Mean Brix <sup>o</sup>	Yield/ Stool (g)
Glen Fyne	5.0	10.2	4981.5
Glen Ample	5.3	9.9	4662.9
Tulameen	5.1	11.8	2495.5
Octavia	5.4	9.9	4596.8

Data from replicated plots at SCRI 2010

## New selections: JHI 0019E2

### At JHI

- Late season
- Large fruit, good shelf-life and flavour
- Long laterals collapsing under weight of fruit



### On-farm trials

- First season in 2010
- Further trialling in progress

	Mean fruit size (g)	Mean Brix <sup>o</sup>	Yield/ Stool (g)
0019E2	6.8	10.1	1862.5
Glen Ample	5.1	9.8	2715.1
Tulameen	5.5	11.7	1757.3

Data from replicated plots at SCRI 2010



## New selections identified in 2009 - 1



### 9350F3

- Mid season, high yield
- Large conical attractive fruit.
- Sweet and pleasant flavour
- Excellent display for picking
- Mean fruit size 5.4g
- Mean Brix° 8.7
- Mean yield 6357.5g/stool



### 0453C4

- Very early season
- Glossy attractive fruit with sweet raspberry flavour
- Fruit size: 4.8g
- Brix° : 11.2
- Yield: 4115g/stool

# New selections identified in 2009 - 2



## 0304F6

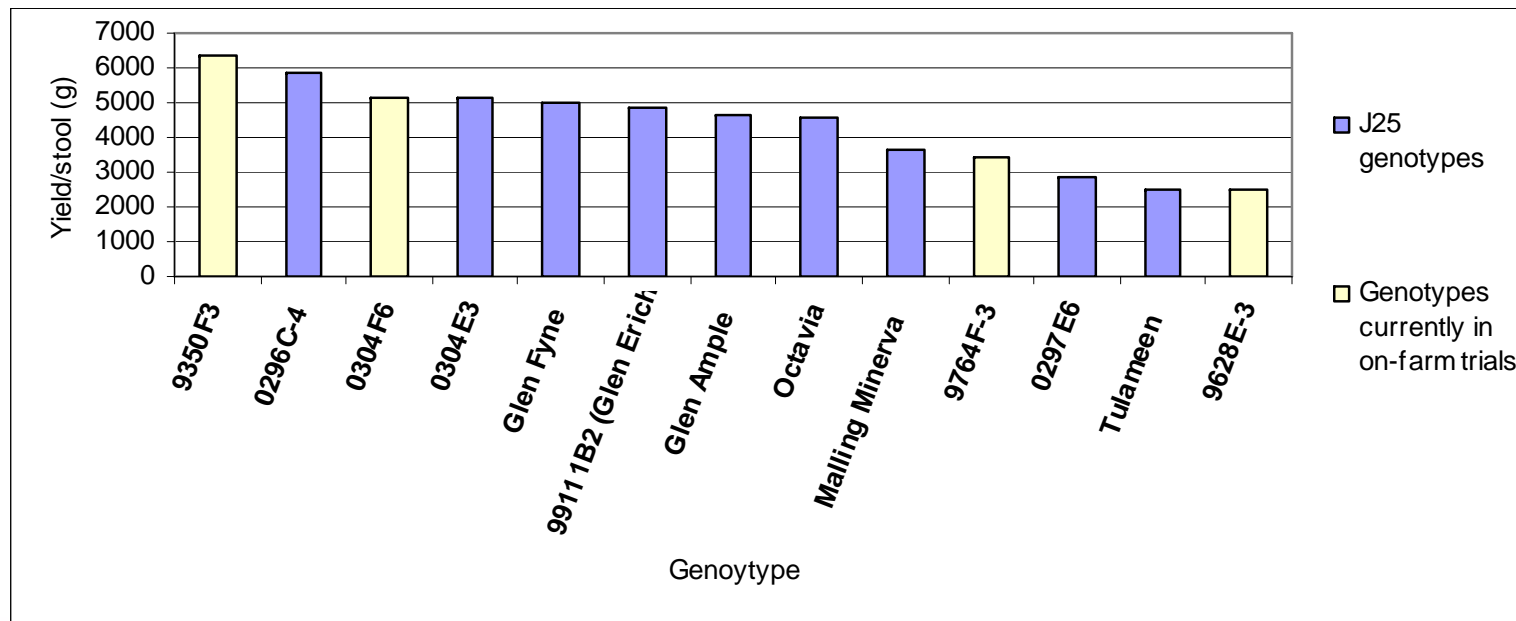
- Mid-late season
- Large meaty pale fruit
- Strong flavour, sweet with a sharp edge
- Fruit size: 5.2g
- Brix°: 11.8
- Yield: 5171.9g/stool



## 0433F2

- Early season
- Glossy and conical, v similar to Tulameen
- Concern with firmness
- Fruit size: 5.1g
- Brix°: 11.2
- Yield: 3422.8g/stool

# JHI Yield J25 (3<sup>rd</sup> season)



## New selections 2010-11 - 1



### 0485K-1

- Large fruit, very glossy, good shelf-life and flavour
- Fruit size: 6.0
- Brix°: 11.1
- Yield: 3631.0

**Selected for on-farm trials**



### 0534RB1

- Enormous fruit
- Fruit size: 6.9g
- Brix°: 12.3
- Yield/stool: 2714.9g

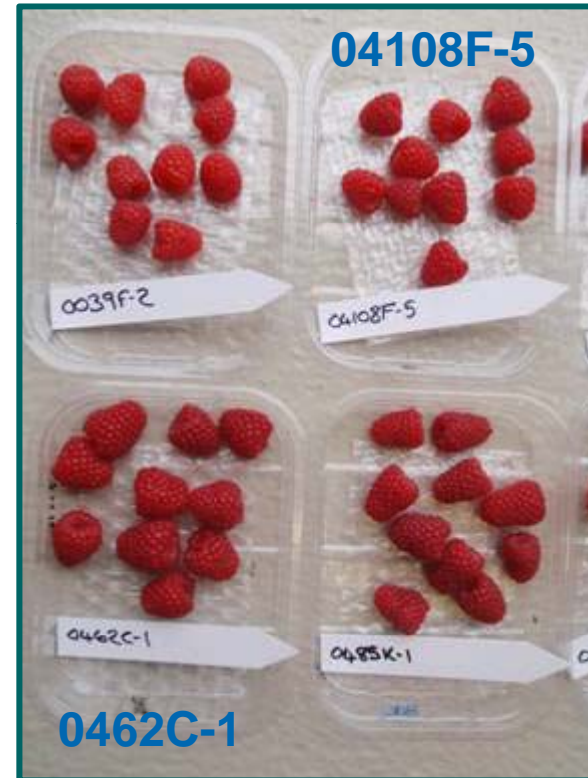
# New selections 2010-11 - 2



**0015F1**



**0511F1**



7 days at 4C



# Molecular markers associated with resistance to *Phytophthora* root rot

- Developed to reduce breeding timescale
- Replace traditional field-based screening methods (Glen Ericht and Glen Cally)
- Mapping population: Glen Moy (susceptible) x Latham (resistant)
- Development of PCR-based markers in 2008
- Strong correlation between root density and resistance
- Mapping population further replicated in different cropping systems to map more traits





# Deployment of markers for resistance to *Phytophthora* root rot

- Parents with resistance marker identified for crossing in 2009 (25 families)
- Progeny screened for absence of spines and aphid resistance
- Progeny currently in process of screening with marker
- Individuals identified with marker under propagation
- Greatly reduce timescale to release a resistant cultivar



# Mapping key traits in raspberry breeding

## Key traits mapped and deployed

- *Phytophthora* root rot (Hortlink 0169)
- *Gene H* and cane diseases

## Other traits mapped

- Sensory characteristics (Hortlink 0170)
  - Fruit size (validation and deployment in 2011-12)
  - Colour, anthocyanins
  - Volatiles, Brix<sup>o</sup>
- Fruit development / ripening

## Traits currently under investigation

- Fruit softening (Hortlink 0195)
- Crumbly fruit
- Plant physical mechanisms
  - Cane splitting
  - Leaf hairs / pest resistance



*Gene H (cane  
pubescence)*



# Integrating conventional and molecular breeding

- Conventional crossing will continue
- A good germplasm base is required
- Marker assisted selection is a valuable ‘toolkit’ which will:
  - Select important traits early in the selection process
  - Eliminate undesirable types before field planting
  - Reduce numbers of early stage breeding material
  - Reduce timescale to cultivar release
- Field trials are necessary after screening
- Results in a more efficient, targeted breeding programme with high quality, low input cultivars





# 'Fruit For the Future' Thursday 14<sup>th</sup> July 2011

