The 'Racer' Project - A Blueprint for Rubus IPM Research

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Introduction

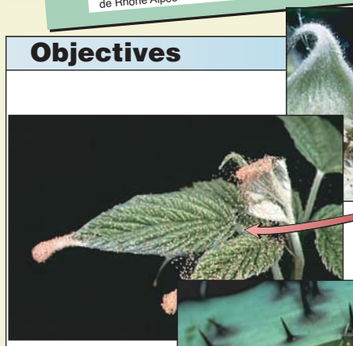
Reduced Application of Chemicals in European Raspberry Production (RACER) was a project that brought together commercial and scientific partners from seven countries in Europe. The aim was to develop suitable monitoring and/or forecasting methods to detect and control a range of arthropod pests of raspberry (*Rubus idaeus*), and a monitoring system for fungi causing post-harvest rots. This multi-centred approach, with specific objectives set by industry, is a blueprint for future research on sustainable raspberry production in Europe. The approach could also be adopted for other small fruits, such as *Ribes*

Partnership

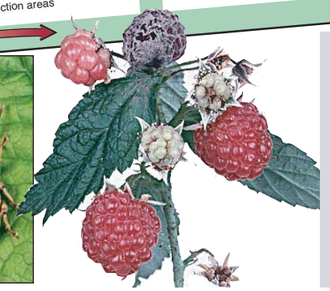
Partner	Country	Type of enterprise
Commercial		
Scottish Soft Fruit Growers Ltd	Great Britain	Grower owned co-operative
Associazione Produttori Agricoli Sant'Orsola s.c.ar.l.	Italy	Marketing and packaging mainly fresh fruit for growers co-operative
Dr. D. Perlepes	Greece	Representing a consortium of farmers establishing a new raspberry industry
Valmira Frutas LDA	Portugal	Fruit and vegetable production company
Pakkasmarja Oy	Finland	A company established by small fruit farmers to market and process fruit
Stiftung Behindertenbetriebe in Kanton Schwyz	Switzerland	Insect traps manufacturer and provider of protected-environment employment for handicapped adults
Scientific		
Scottish Crop Research Institute	Great Britain	Research centre with expertise in cane and bush fruit crops
Istituto Agrario Provinciale di S. Michele all'Adige	Italy	Research and teaching organisation with expertise in fruit research in Italy
Agricultural Research Centre (MTT) Institute of Plant Protection	Finland	Expertise in integrated pest management on top and small fruits
Eidgenössische Forschungsanstalt für Obst-, Wein- und Gartenbau (FAW)	Switzerland	Research and development centre involved in integrated production fruit production.
National Agromet Unit, ADAS	Great Britain	Expertise in agro-meteorological modelling and forecasting
Biomathematics & Statistics Scotland	Great Britain	International reputation in applied and biological sciences mathematics and statistics
Service Régional de la Protection des Végétaux de Rhone Alpes	France	Advisory and research organisation

2-year project funded by EU under the Technology Stimulation Measures for SME's 'CRAFT' and Bundesamt für Bildung und Wissenschaft in Switzerland with matched funding by Small to Medium Sized Enterprises (SMEs) partners throughout Europe

Objectives



Pests and diseases	Economic importance and distribution	Research Area
Raspberry beetle (*Byturus tomentosus*)	Very High, Widespread in northern Europe	Monitoring adult flight activity - develop spray threshold
Two-spotted spider mite (*Tetranychus urticae*)	High, Widespread in Continental Europe/protected cultivation	Develop methods to manage and understand two-spotted spider mite population development
Raspberry cane midge (*Resseliella theobaldi*)	High, Widespread	Improve raspberry cane midge population forecasting
Otiorhynchid weevils (*Otiorhynchus* spp.)	High, Widespread	Develop monitoring system to predict Otiorhynchid weevil activity
Post-harvest rots (moulds) (*Botrytis cinerea* + others)	Very High, Widespread in all production areas	Develop standardised procedure to identify and assess levels of post-harvest rots



Acknowledgements
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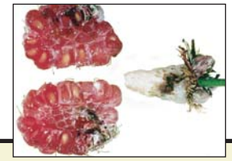
The 'Racer' Project Summary of Results and Achievements

Raspberry Beetle - Monitoring threshold

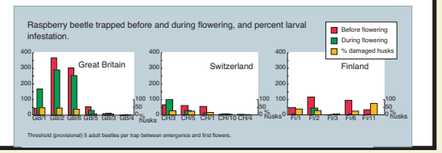
Adult behaviour and dispersal - emerge from soil in spring. Adults may fly to other Roseaceous host or fly within the plantation. When raspberry flowers open they migrate to them to mate and oviposit.

Flying adults are attracted to white traps (Rebell® bianco).

Monitoring - a relationship established between adults caught on traps and subsequent larval damage to ripe fruit.



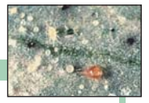
Control threshold proposed for Great Britain and Switzerland - <5 beetles per trap for fresh fruit, <20 beetles per trap for processed fruit.



Management of two-spotted spider mite

Two-spotted spider mites (TSSM) most common but yellow spider mite (*Eotetranychus carpini*) was common in Italy. Population dynamics of TSSM and predatory phytoseiids, and species composition of naturally occurring predatory mites differed between countries.

Native predatory mites were the key factor in TSSM management in all areas.



Native Predatory Mites
Finland *Phytoseius macropilis*
Italy *Amblyseius andersoni*
Switzerland *Typhlodromus pyri/Euseius finlandicus*
Greece *Phytoseius plumifer*

Release of commercially available predators can enhance TSSM management.

Species tested:
Phytoseiulus persimilis
Amblyseius cucumeris
Amblyseius californicus
Typhlodromus pyri

Raspberry Cane Midge forecasting

The disease complex 'Midge Blight' can be controlled by accurate insecticide spraying against first generation raspberry cane midge eggs and larvae.

Monitoring system, developed in the UK, was tested in different countries. The Degree days from 1 February to first eggs determined.

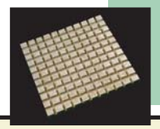
Finland	~200
France	312
Italy	260
Switzerland	360
UK	326

Wingless weevils - monitoring

Wingless weevils (*Otiorhynchus* spp.) are now important pests of raspberry in Europe.

Damage caused by adult and larval feeding.

Two passive traps examined, groove trap and dark landscape fabric trap. Neither was as effective as nocturnal beating.



Weevils recorded -

UK:	Clay-coloured weevil *(Otiorhynchus singularis)*
Finland:	Vine weevil *(O. sulcatus)*
Italy:	Strawberry Weevil *(O. ovatus)*
	Vine weevil *(O. sulcatus)*
	Strawberry Weevil *(O. ovatus)*
	O. armadillo
	O. apenninus
	O. globus

Post-harvest Rot - development of standardised sampling procedure

Post-harvest rots (grey mould (*Botrytis cinerea*) and other fungi) cause considerable spoilage of soft fruit.

A standardised sampling method was developed and tested. Procedure: 80 fruits "incubated" at c. 20-25°C and 10% infection level assessed. Some geographical variation observed.

Training / information dissemination

Grower seminars/workshops held in all participating countries.

Advisors/field officers and growers attended and participated in sampling.

Web site:
www.scri.sari.ac.uk/assoc/racer