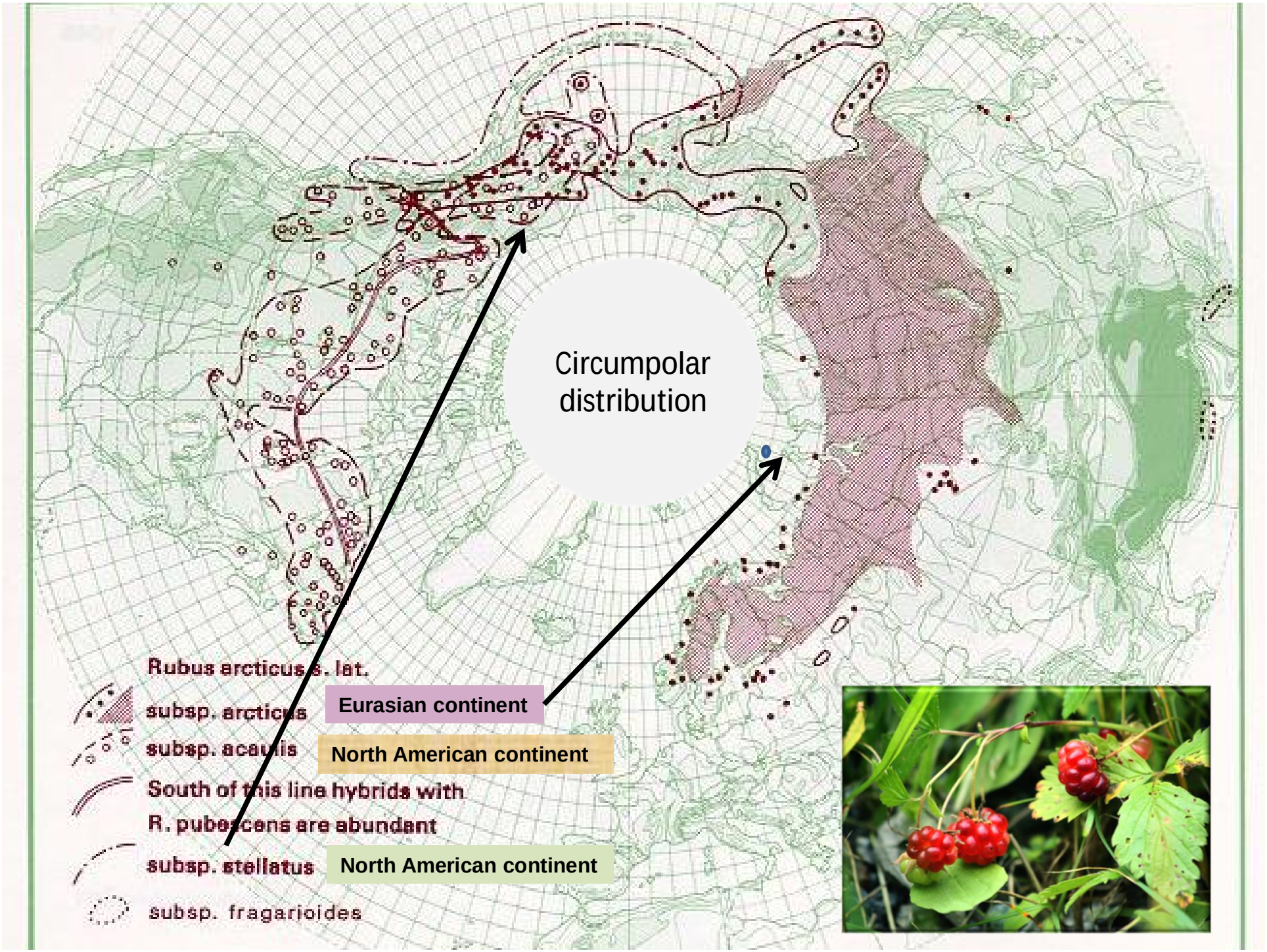
The selection and domestication of wild berries

Current status - arctic bramble

Harri Kokko

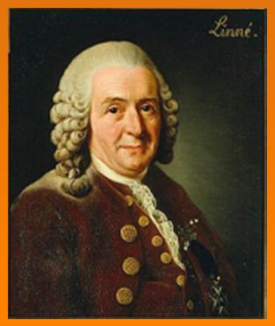
NWFP, Espoo, Finland, 12-13.11.2013


Circumpolar distribution
Rubus arcticus s. lat.
subsp. arcticus
subsp. acaulis
South of this line hybrids with R. pubescens are abundant
subsp. stellatus
subsp. fragarioides
Eurasian continent
North American continent
North American continent

Short history of domestication

- **Carl von Linneaus**
- transfered first plats from nature to the Botanical garden of Upsala 1762

”Bären av denna växt, äro ofelbart de smakligaste av all frukt, som växer självmant, icke endast i Sverige, utan i hela Europa”



- **Experinments and hybrid breeding**

Sweden: Larson G.

- *R. arcticus* x *R. stellatus*

Finland: 1) Ryynänen A. 2) Hiirsalmi H. 3) Dalman P.

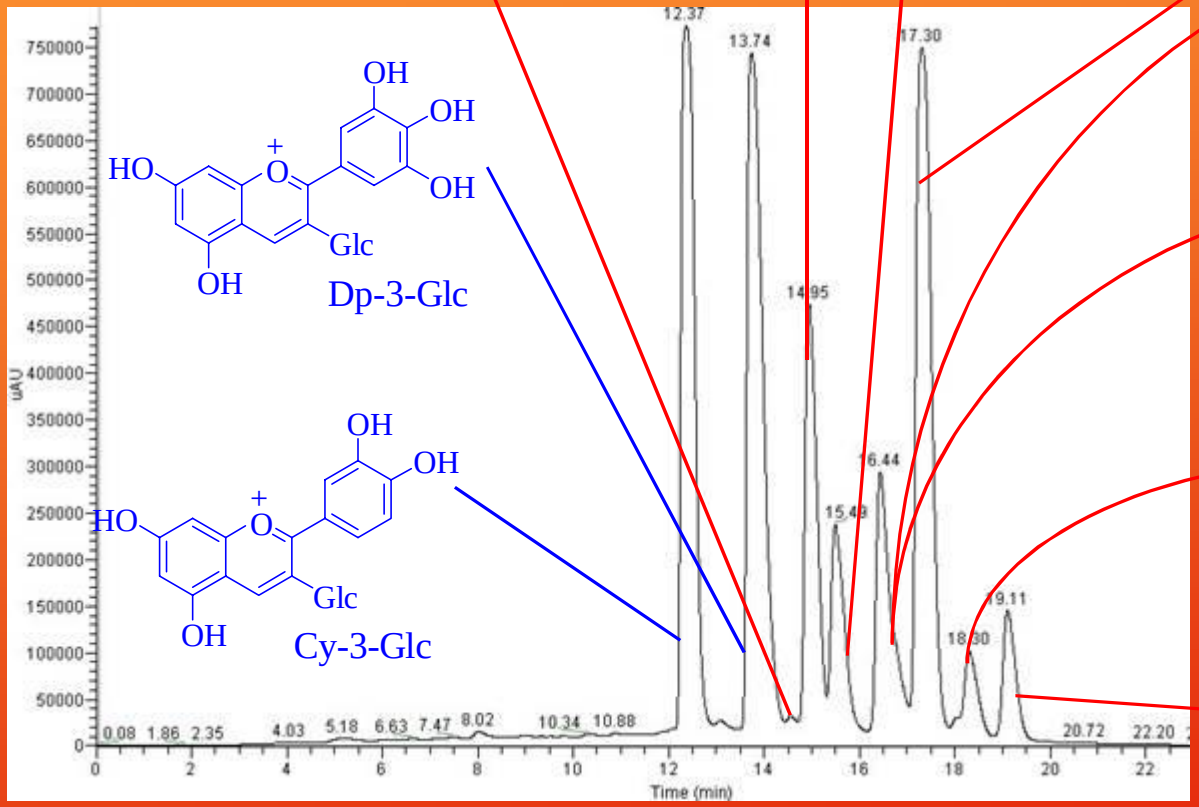
- *R. arcticus* x *R. ideaus*

Russia: 1) Cernova, 2) Evdokimenko, S.N

- Bryansk raspberry breeding:

hybridization of *R. idaeus, R. occidentalis, R.odoratus, R. crataegifolius, R. spectabilis, R. arcticus*

Antochyanins of *R. arcticus*



Dp-3-Ara

Pt-3-Glc

Cy-3-Ara

Mv-3-Glc

Pn-3-Glc

Pt-3-Ara

Pn-3-Ara

Mv-3-Ara

Dp-3-Glc

Cy-3-Glc

Cultivars

’Mespi’ and ’Mesma’ - Ryynänen; 1972

’Pima’ = ’Mespi’ x ’Mesma’ **-** Ryynänen and Dalman; 1983:

’Elpee’, ’Muuruska’, ’Marika’ - Pirinen, Dalman, Kärenlampi,Tammisola, Kokko; 1998

’Susanna’ - no publication

’Alli’ - Kostamo, Toljamo, Antonius, Kokko, Kärenlampi; 2013

SSR-markers were developed for cultivar identification

(A) Cultivar SSR alleles (bp)		*n*	(B) Diverging alleles from cultivar collections		
‘Alli’	126, 175	13	126, 177		
‘Elpee’	135, 157	5			
‘Marika’	159, 163	4	123, 175	150, 175	175, 175
‘Mesma’	146, 148	7			
‘Mespi’	126, 173	6	146, 173		
‘Muuruska’	135, 165	6			
‘Pima’	126, 135	9	123, 126	131, 175	
‘Susanna’	175, 175	1			

2013:11 (4)
ANNALS OF BOTANY Founded 1887

Morphological and molecular identification to secure cultivar maintenance and management of self-sterile *Rubus arcticus*

K. Kostamo[1,2,*], A. Toljamo[1], K. Antonius[3], H. Kokko[1] and S. O. Kärenlampi[1]

Dryberry disease

Caused by *Perenospora sparsa*

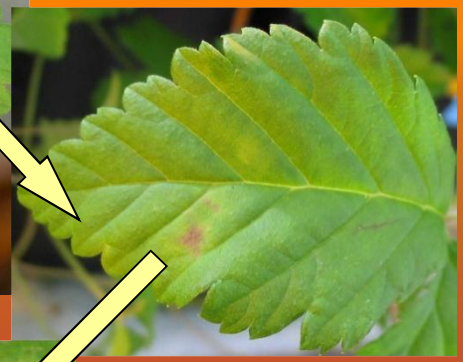
- Redish irregular leaf spots
  - Syptoms vried amonng cultivars
- Berry malform

  -> loss of crop - even total

qPCR of downy mildew

cv. Pima

cv. Alli



Hukkanen A, Pietikäinen L, Kärenlampi S, Kokko H. Quantification of downy mildew (Peronospora sparsa) in Rubus species using real-time PCR EUROPEAN JOURNAL OF PLANT PATHOLOGY 2006,116: 225-235.

Detection and control of downy mildew

European Journal of Plant Pathology
November 2006, Volume 116, Issue 3, pp 225-235

Quantification of downy mildew (*Peronospora sparsa*) in *Rubus* species using real-time PCR

Anne Hukkanen, Liisa Pietikäinen, Sirpa Kärenlampi, Harri Kokko

2008, 56, 1008–1016

JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY

Impact of Agrochemicals on *Peronospora sparsa* and Phenolic Profiles in Three *Rubus arcticus* Cultivars

ANNE HUKKANEN,*,† KATRI KOSTAMO,†,§ SIRPA KÄRENLAMPI,† AND HARRI KOKKO†

MOLECULAR PLANT PATHOLOGY (2008) **9**(6), 799–808 DOI: 10.1111/J.1364-3703.2008.00502.X

Benzothiadiazole affects the leaf proteome in arctic bramble (*Rubus arcticus*)

ANNE HUKKANEN[1,*], HARRI KOKKO[1], ANTONY BUCHALA[2], JUKKA HÄYRINEN[1] AND SIRPA KÄRENLAMPI[1]

Breeding and selection of downy mildew resitant cultivars

Clone selection under open-field

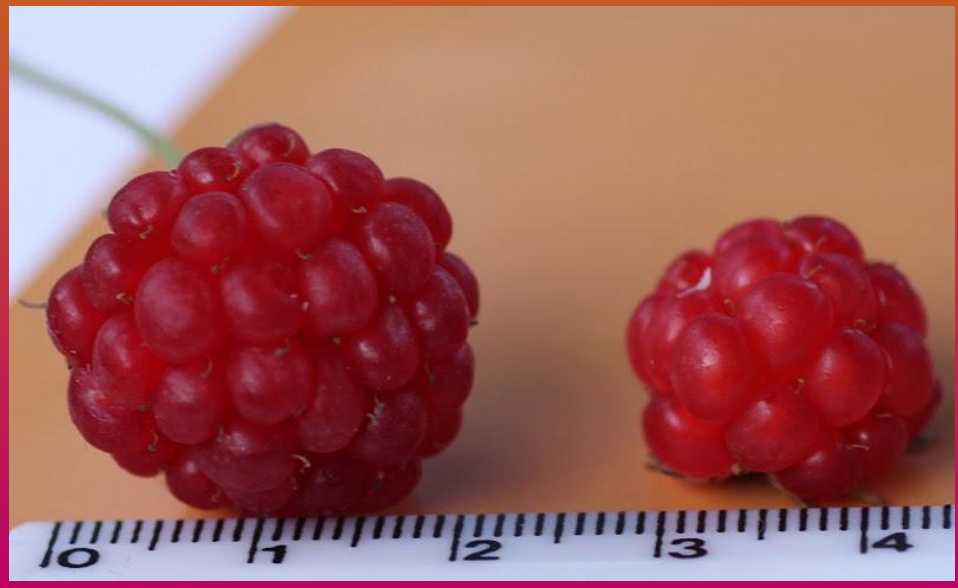
”Hanging plants” with raincover

Promising clones between 2009-12

- resistant agains downy mildew
- good crop, big berry size, uni colour
- Good flavor and aroma

clone154 (Mespi x Alli)

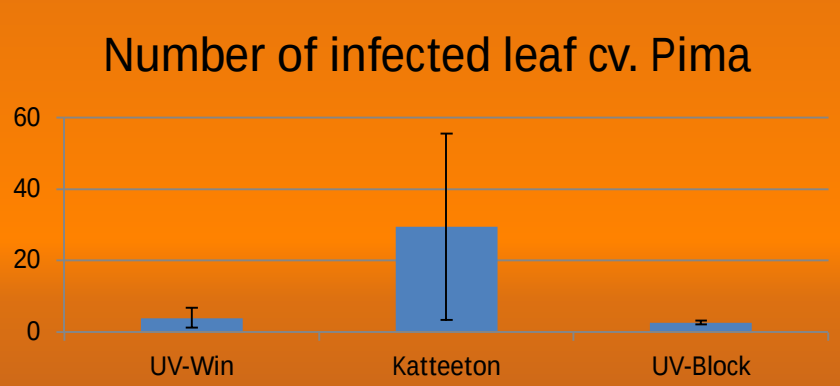
clone164 (Reiska x Alli)

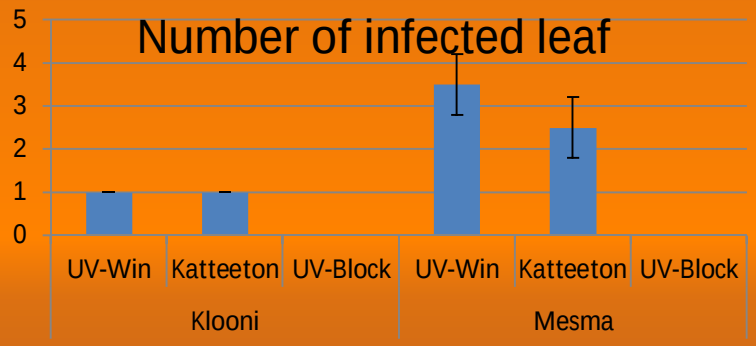


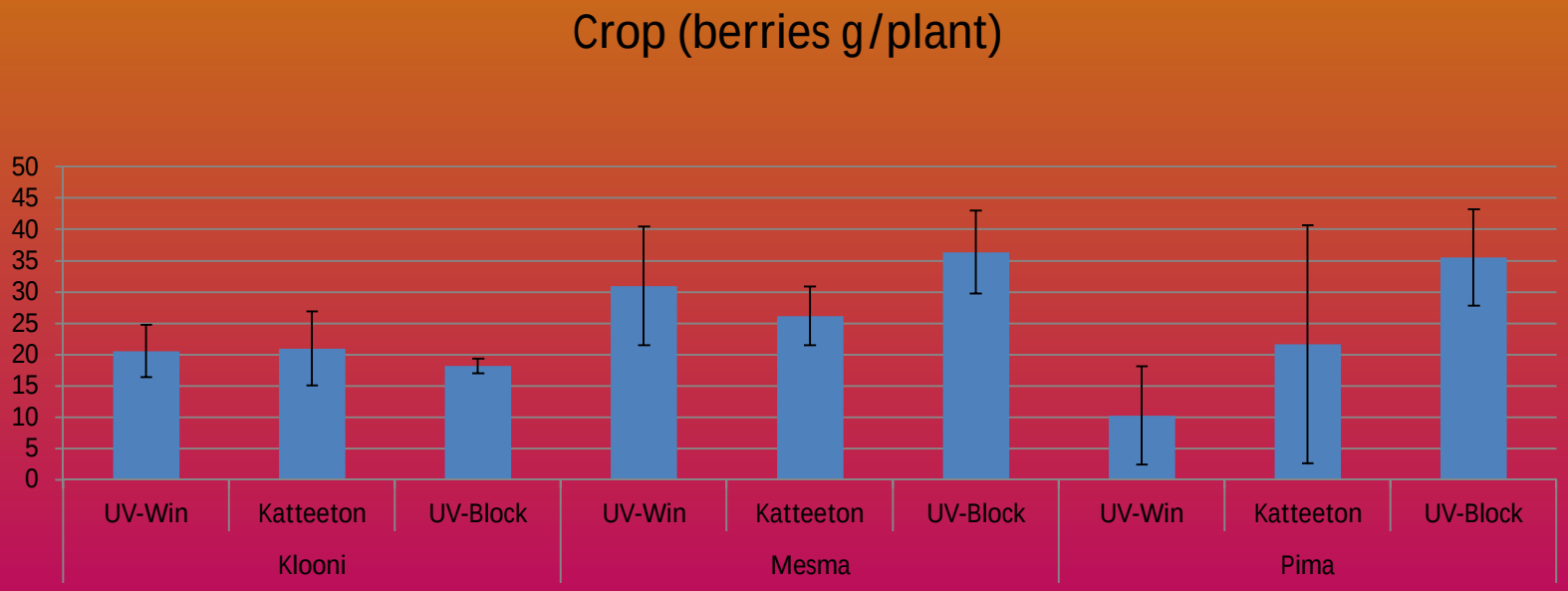

Bumblebee Pollination
beeline
PUUTARHALIIKE HELLE OY
Batchcode: 29/012/1
Placement: 08-01-2010
Week in: 01 Belicht
Syngenta Bioline Bees
Syngenta Bioline
syngenta


Fotoselective plastic cover
different UV transparency

Effect of plastic covers







Initiation greenhouse and tunnel experinments 2012

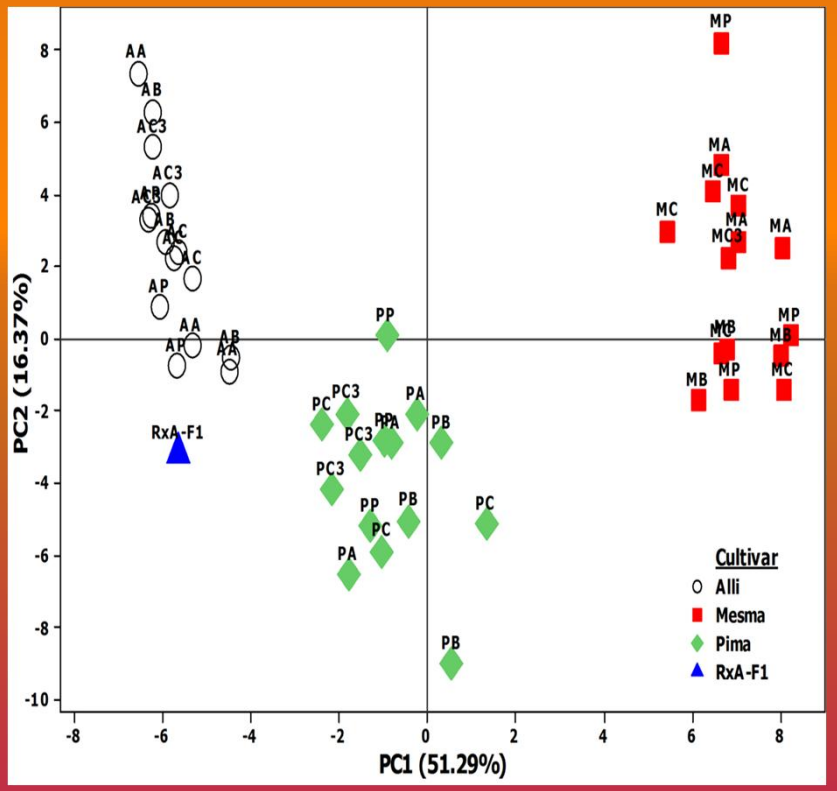
Plant towers 2013-2015
New cultivation technique

- 5 to 10 more plants per m^2
- Irrigartion experinments
- Fertilization experinments
- Nutrient recirculation
- Light intensity and wavelength vs. flowering intensity
- Easy and more rapid hand picking of berries

Arctic bramble volatile profiling

Jens Rohloff Dep. Biology, Norwegian University of Science and Technology Trondheim, Norway

- **79 aroma metabolites**
- 16 aliphatic esters
- 16 aromatic structures
- 12 terpenes
- 10 alcohols
- 5 ketones
- 4 carotenoid degrad. products
- 3 furanes
- 2 aldehydes
- 10 unknown structures



Main aroma **mesifurane** = (2,5-dimethyl-4-methoxy-2,3-dihydro-3-furanone)
Was detected at high levels in all berries

Ongoing work and future aims

- **New superior cultivars:**
  - Resistant cultivars agianst *P. sparsa*
  - High yiled
  - Favourable colour
  - Big berries
  - Unique aroma and voltiles
- **New cultivation technology:**
  - Plant towers
  - Nuterien optimisation
- **NGS and genome sequnecing**
  - cv. Mespi
  - Dual transcriptome of *P. sparsa* and *R. arcticus* during infection


Thanks
SUOMEN KULTTUURIRAHASTO
UNIVERSITY OF EASTERN FINLAND
Euroopan maaseudun kehittämisen maatalousrahasto: Eurooppa investoi maaseutualueisiin