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# Tree breeding as a tool to minimize possible adverse effects of climate change on forest trees

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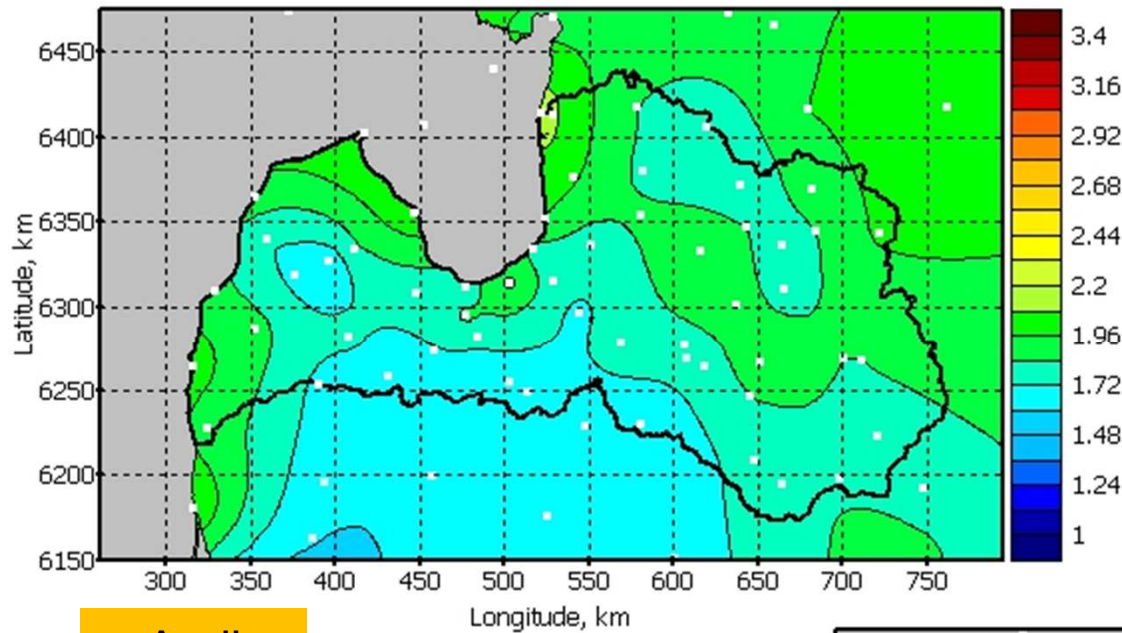
Tours, 22.05.2012.

# Predicted climate changes

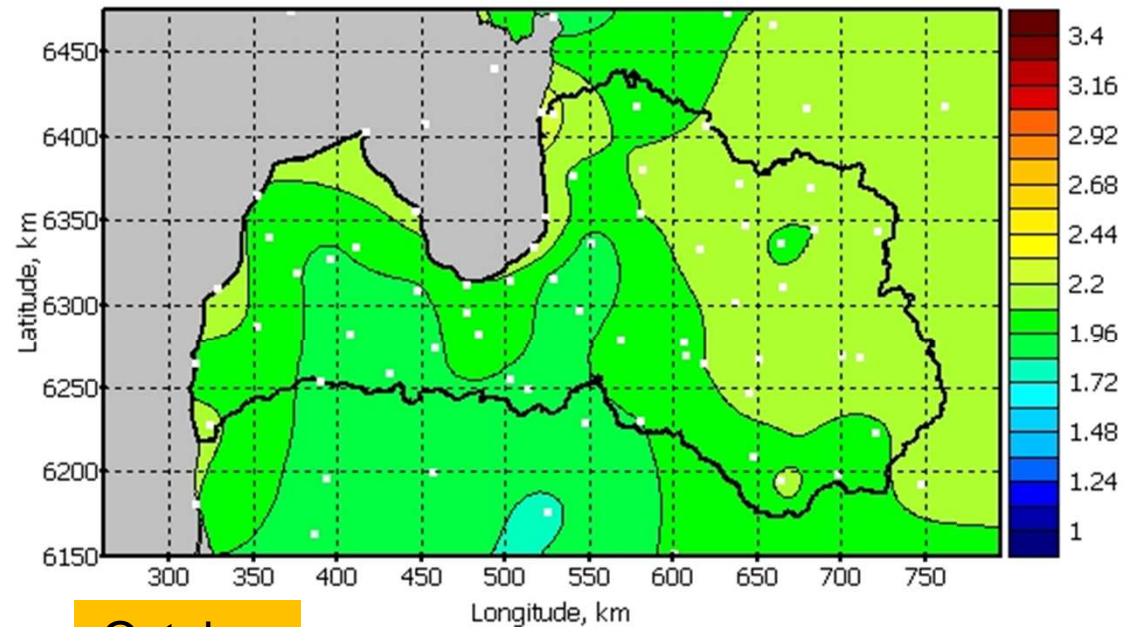


**2021-2050**

monthly mean  $t^0$



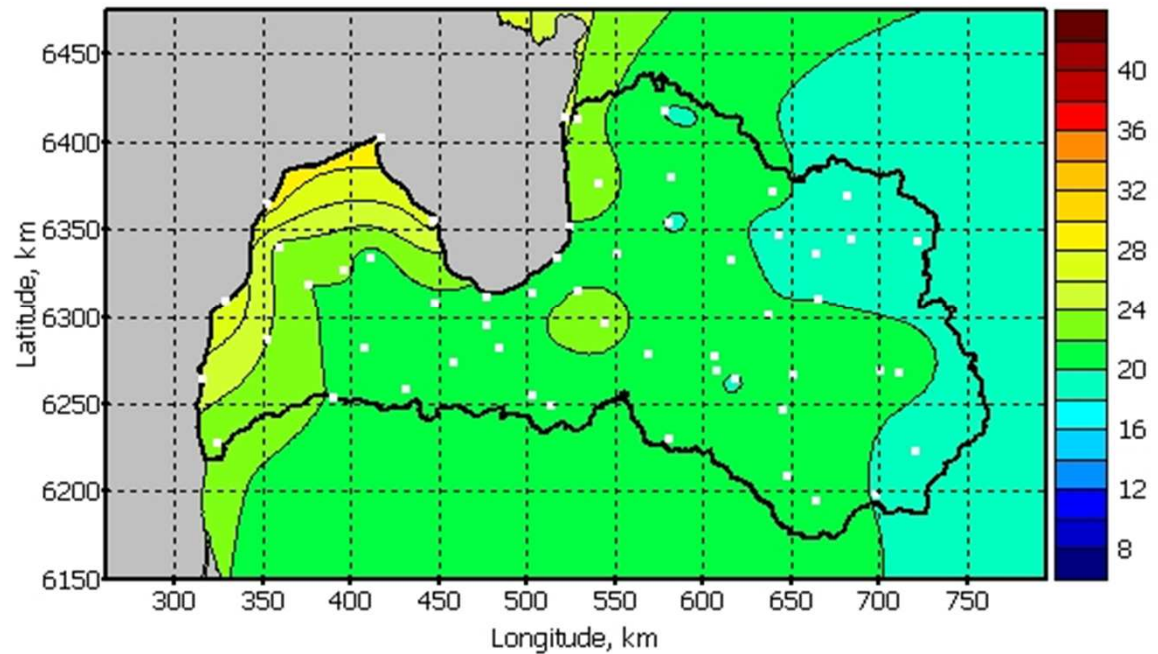
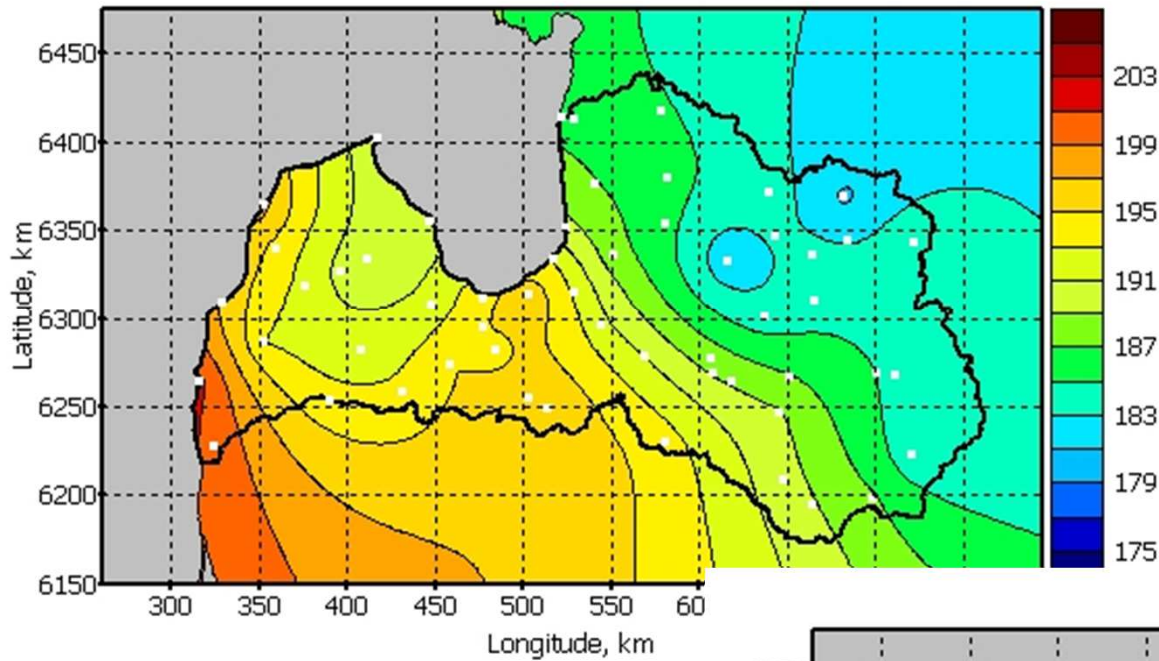
April



October

Bethers u.c., 2010

# Predicted climate changes



Bether et al., 2010

The predictions are that we will have a bumpy ride ahead



Because trees will have to adapt to rather sharp changes in environment

## Resistance

### Scots pine resistance to needle cast (*Lophodermium seditiosum* Minter, Staley & Millar)



Grade 5

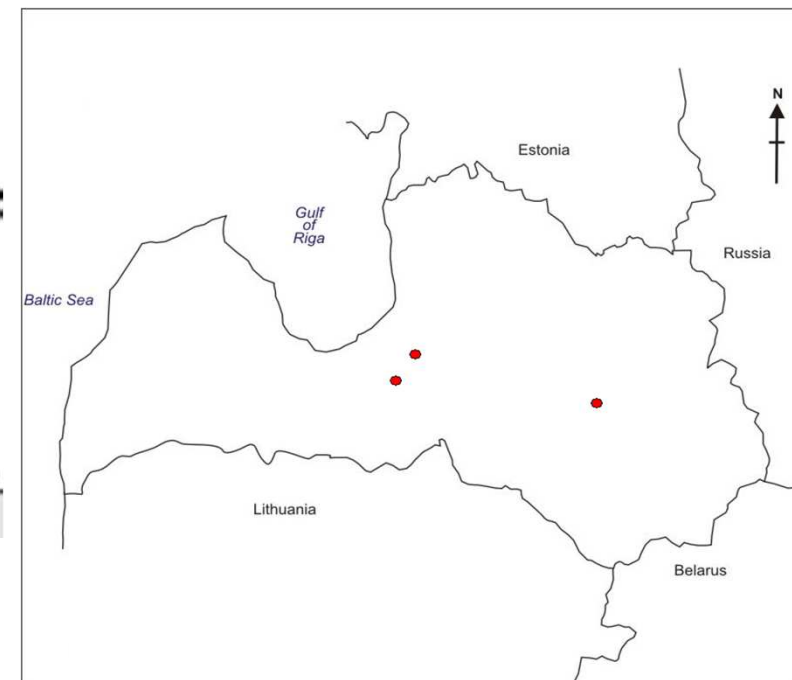
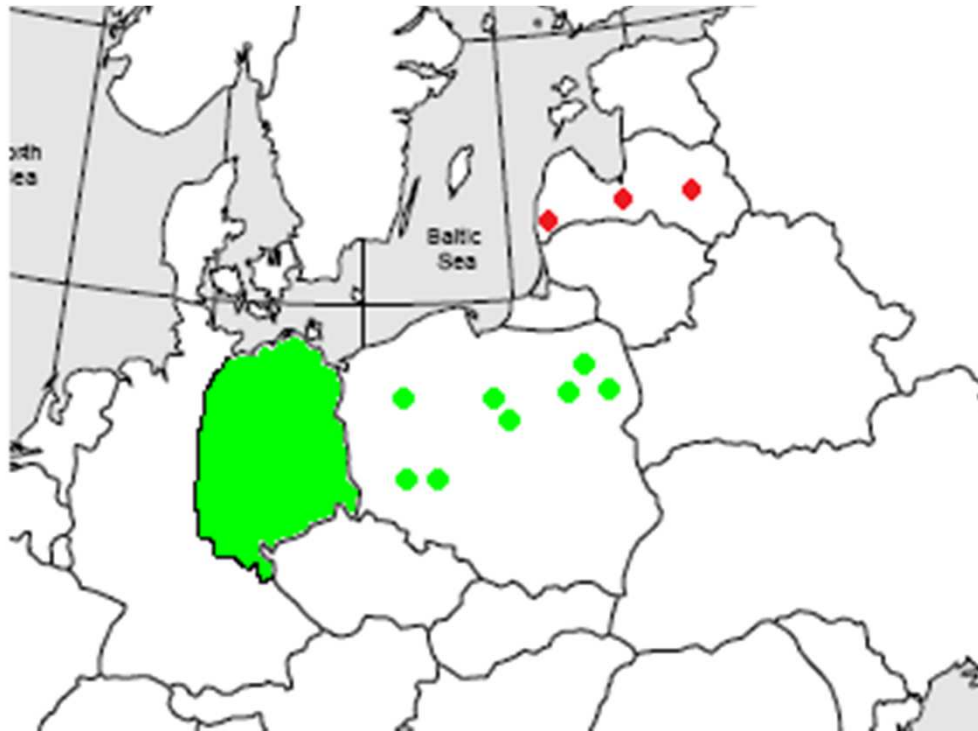


Grade 1

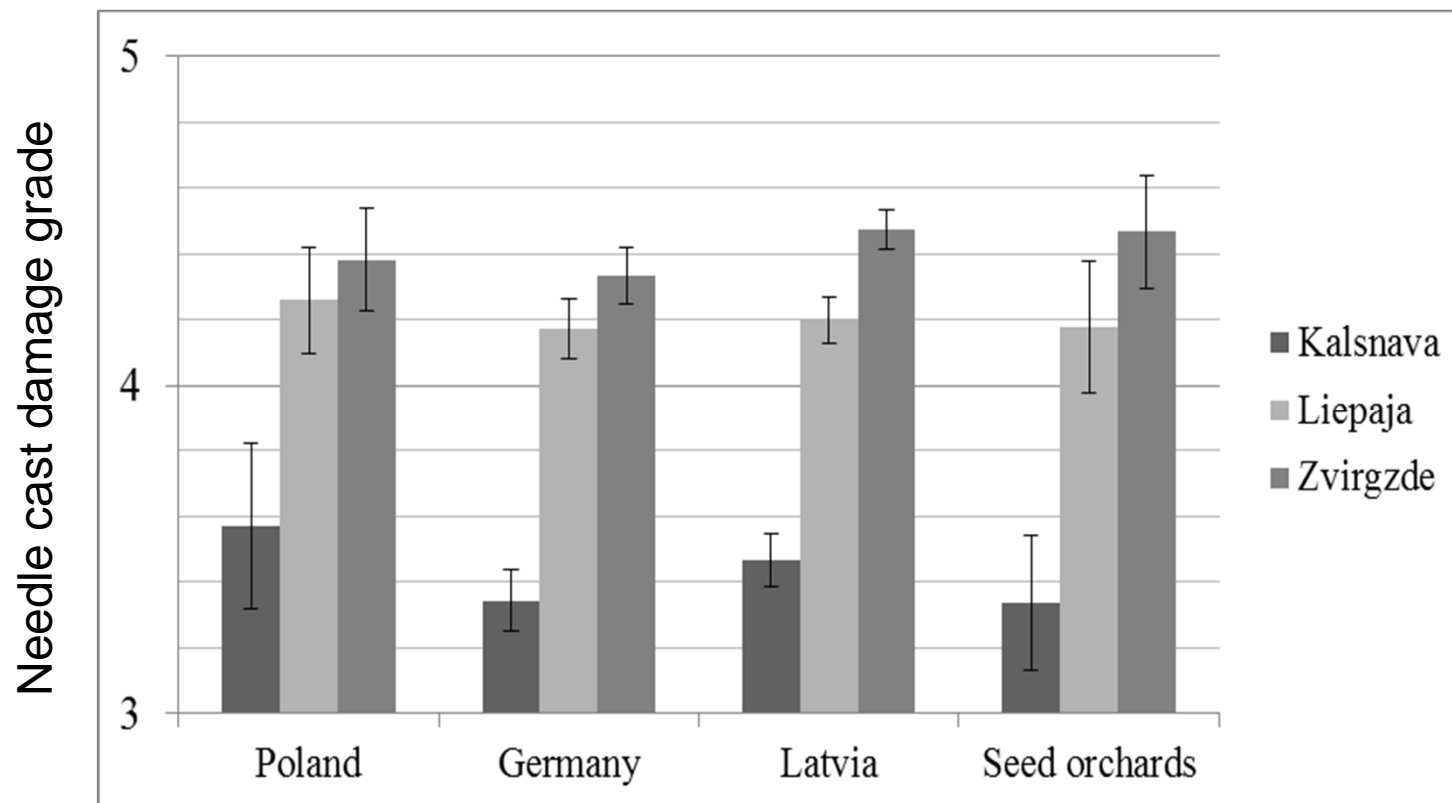
Grade	Percents of damaged needles
1	0-5%
2	6-35%
3	36-65%
4	66-95%
5	96-100%

Assessments were made in June in three sets of trials:

- geographical provenance trial in 8<sup>th</sup> growing season
- open-pollinated progeny trial of Latvia's Scots pine plus trees in 4<sup>th</sup> and 5<sup>th</sup> growing season
- open-pollinated progenies of Latvia's Scots pine plus trees in nursery in 3<sup>d</sup> growing season



- Negligible differences in needle cast damage grade among geographical provenance regions (Germany, Poland, Latvia)
- Trial location played a significant role in determination of needle cast damage grade: disease was more pronounced in Liepaja and Zvirgzde than in Kalsnava.

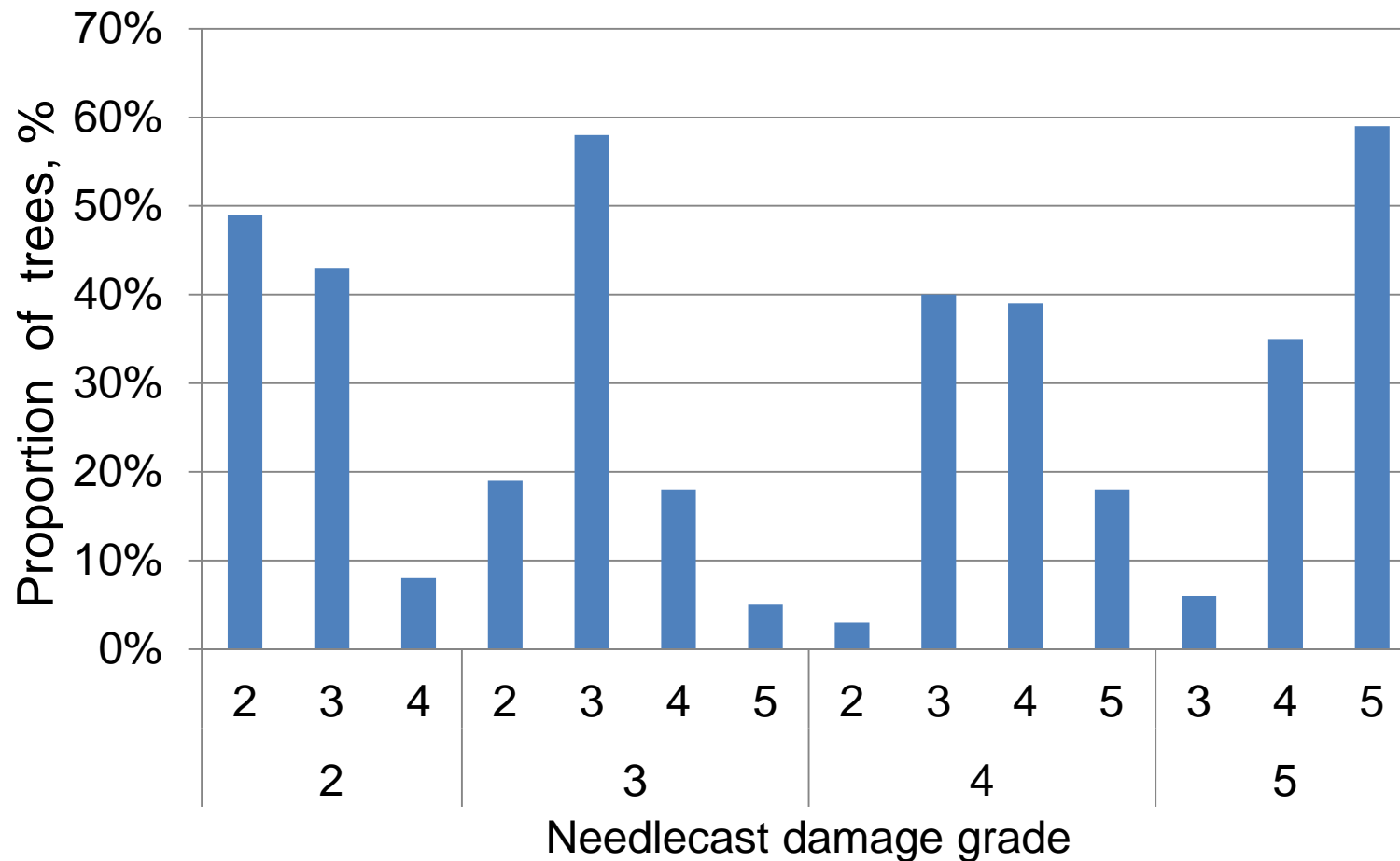


Significant influence on height increment and survival and significant differences among local provenances and families were found



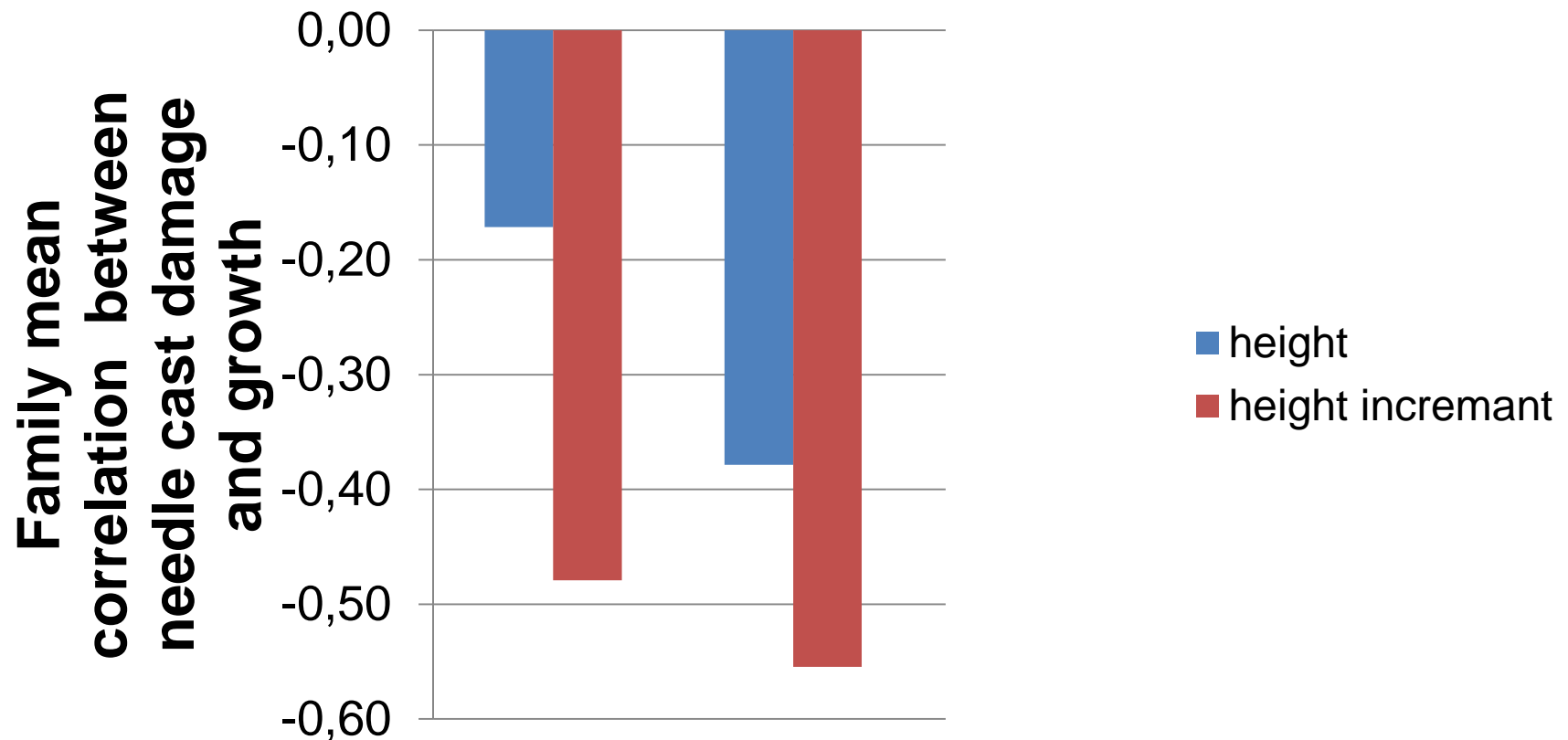
Population	Trait	Needlecast damage, grades				Significance
		2	3	4	5	
Ūķene	increment, cm	23	21	20	18	$\alpha > 0.05$
	survival, %	83	79	75	73	$\alpha > 0.05$
Smiltene	increment, cm	25	26	22	22	$\alpha > 0.05$
	survival, %	87	86	84	84	$\alpha > 0.05$
Tukums	increment, cm		27	23	19	$\alpha < 0.01$
	survival, %		88	80	65	$\alpha < 0.01$
Misa	increment, cm	27	23	20	18	$\alpha < 0.01$
	survival, %	90	79	72	56	$\alpha < 0.01$





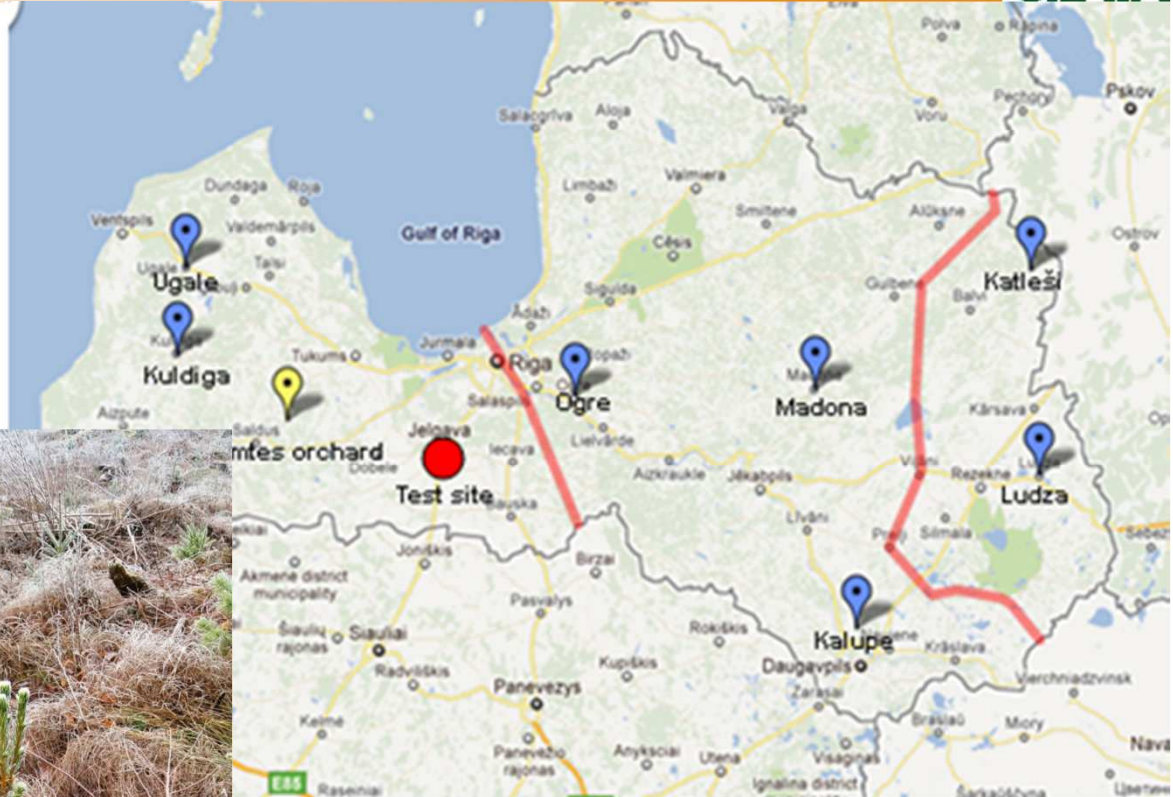
Differences in resistance are relative stable in time (family mean correlation for degree of damages  $r_{fam}=0.77$ ) and space (provenance mean correlation among 3 test sites  $r=0.71-0.77$ , site x provenance interaction non-significant; family mean correlation between two sites for tree height and for needle cast damages  $r_{fam}=0.43$ )

Influence of disease tend to have a cumulative effect

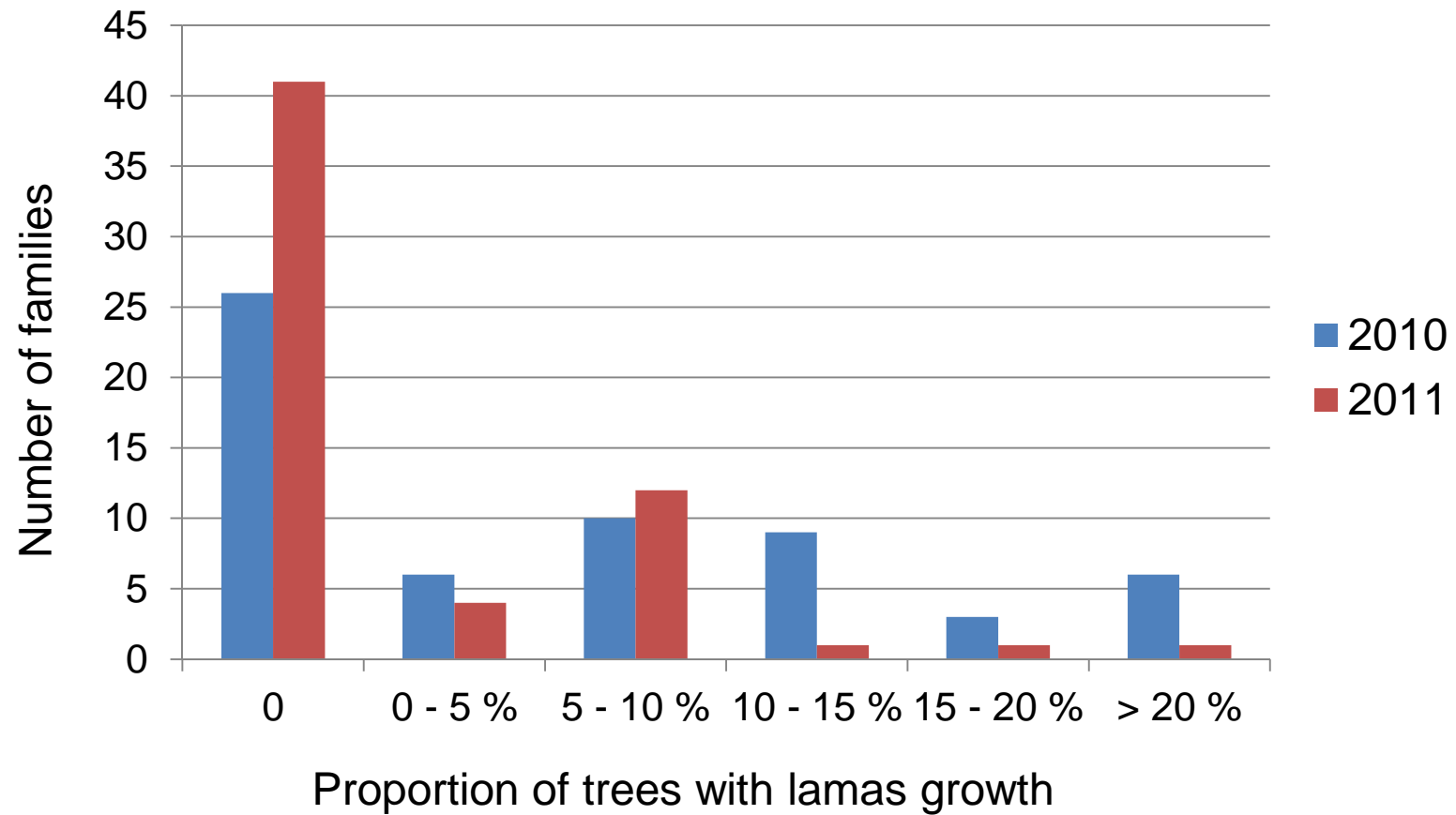


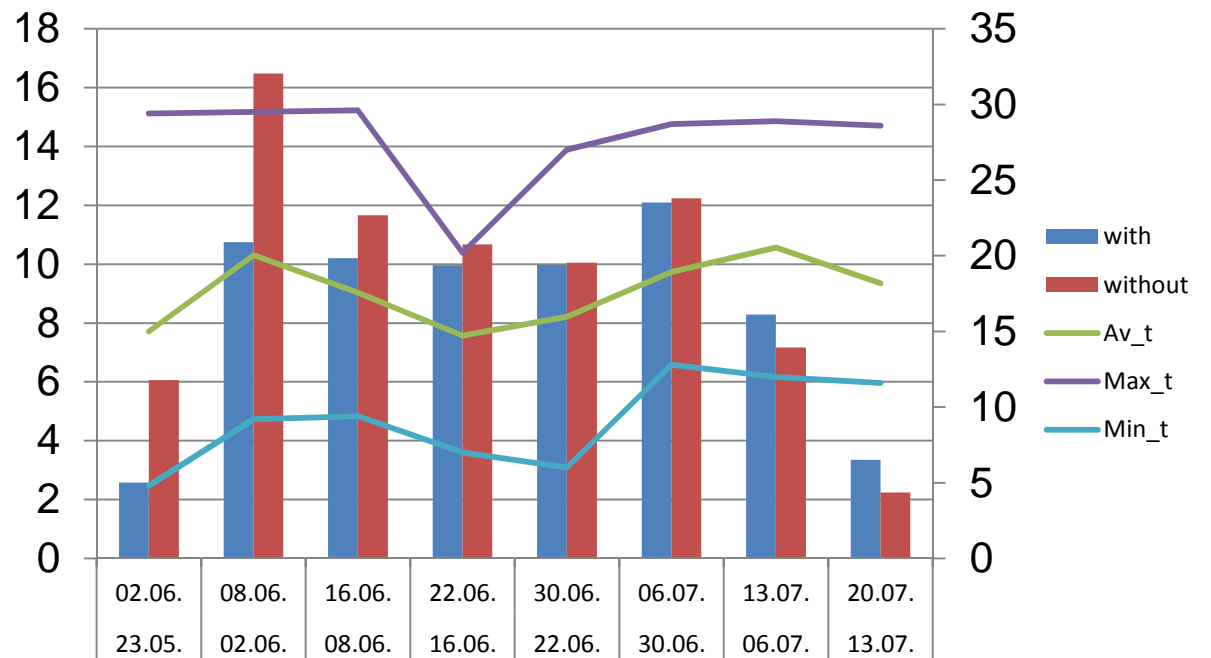
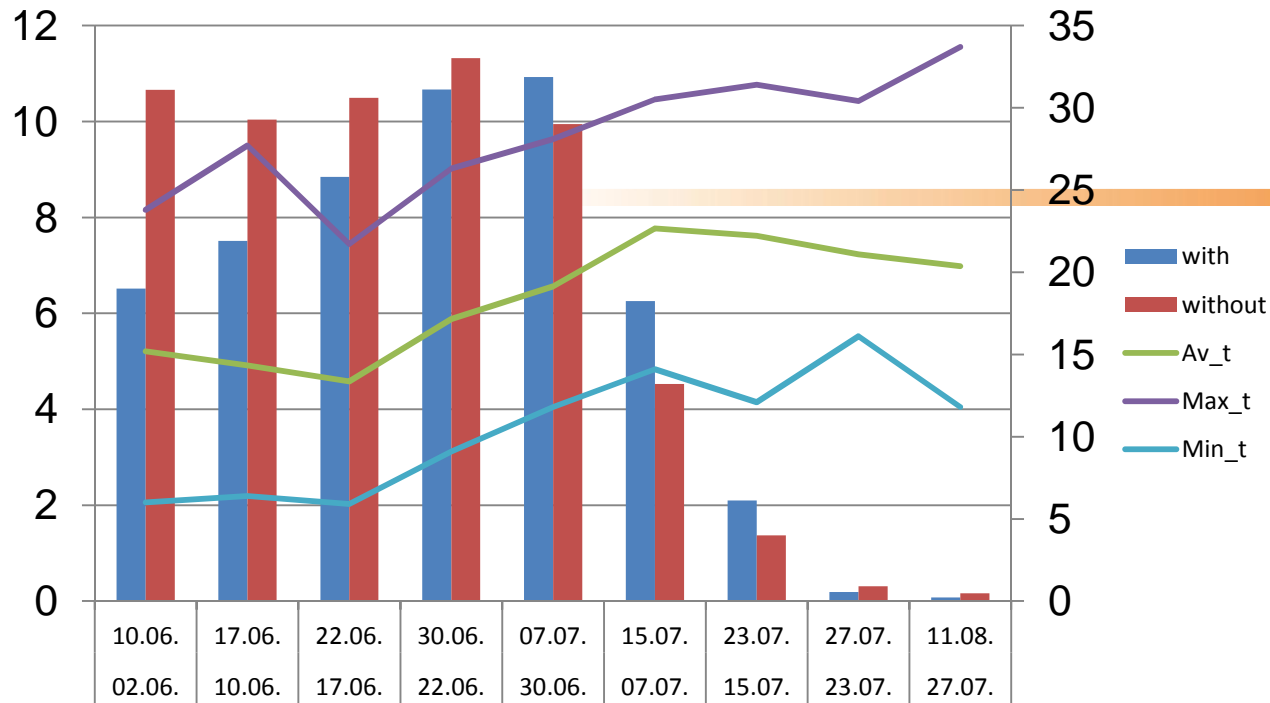
# Resistance

## Formation of lamas growth



# Resistance

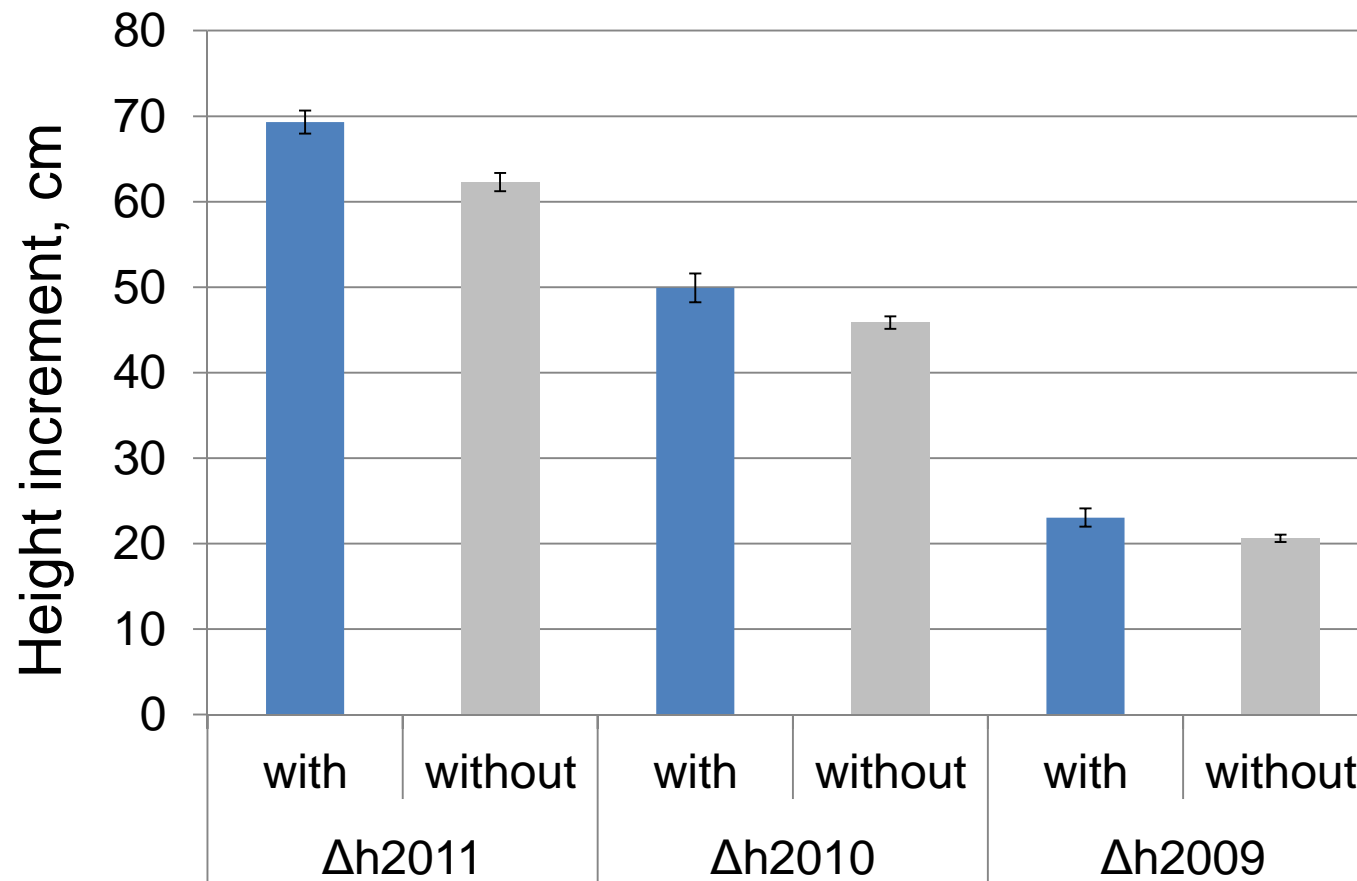




## Resistance



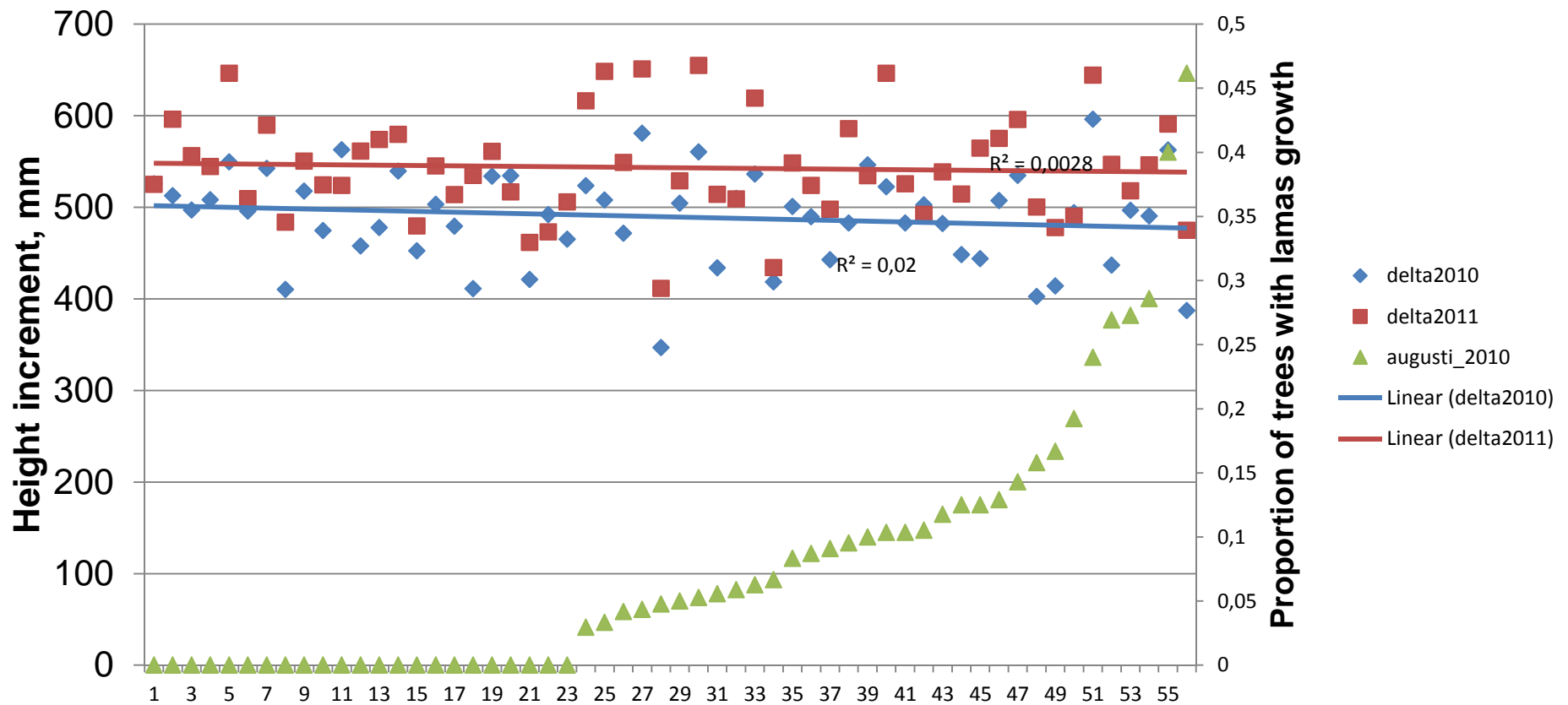
Trees with lamas growth tend to have longer height increment



# Resistance

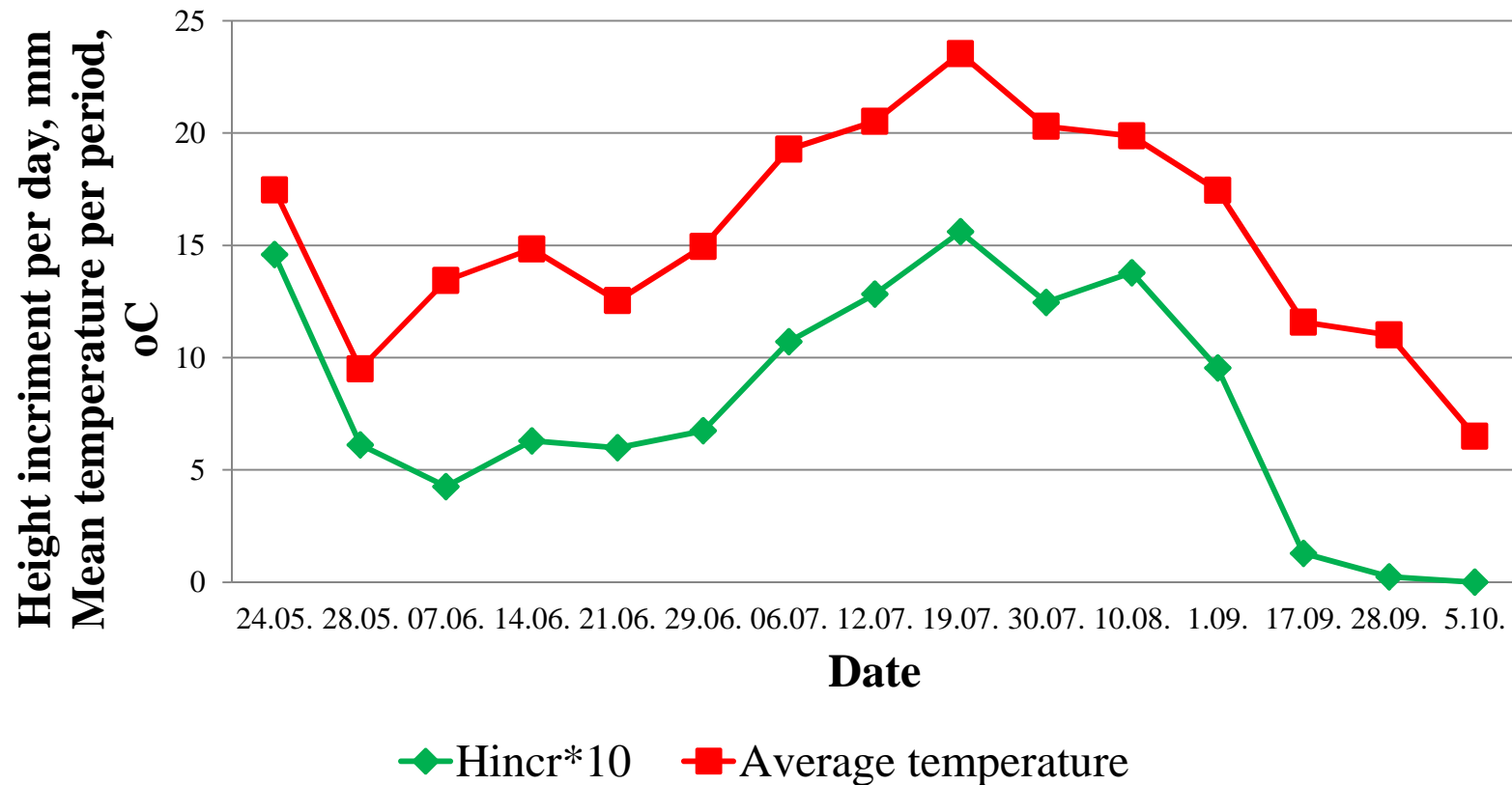


Families with higher proportion of trees with lamas growth does not tend to have larger height increment



# Growth

## Influence of meteorological conditions on height increment of hybrid aspen



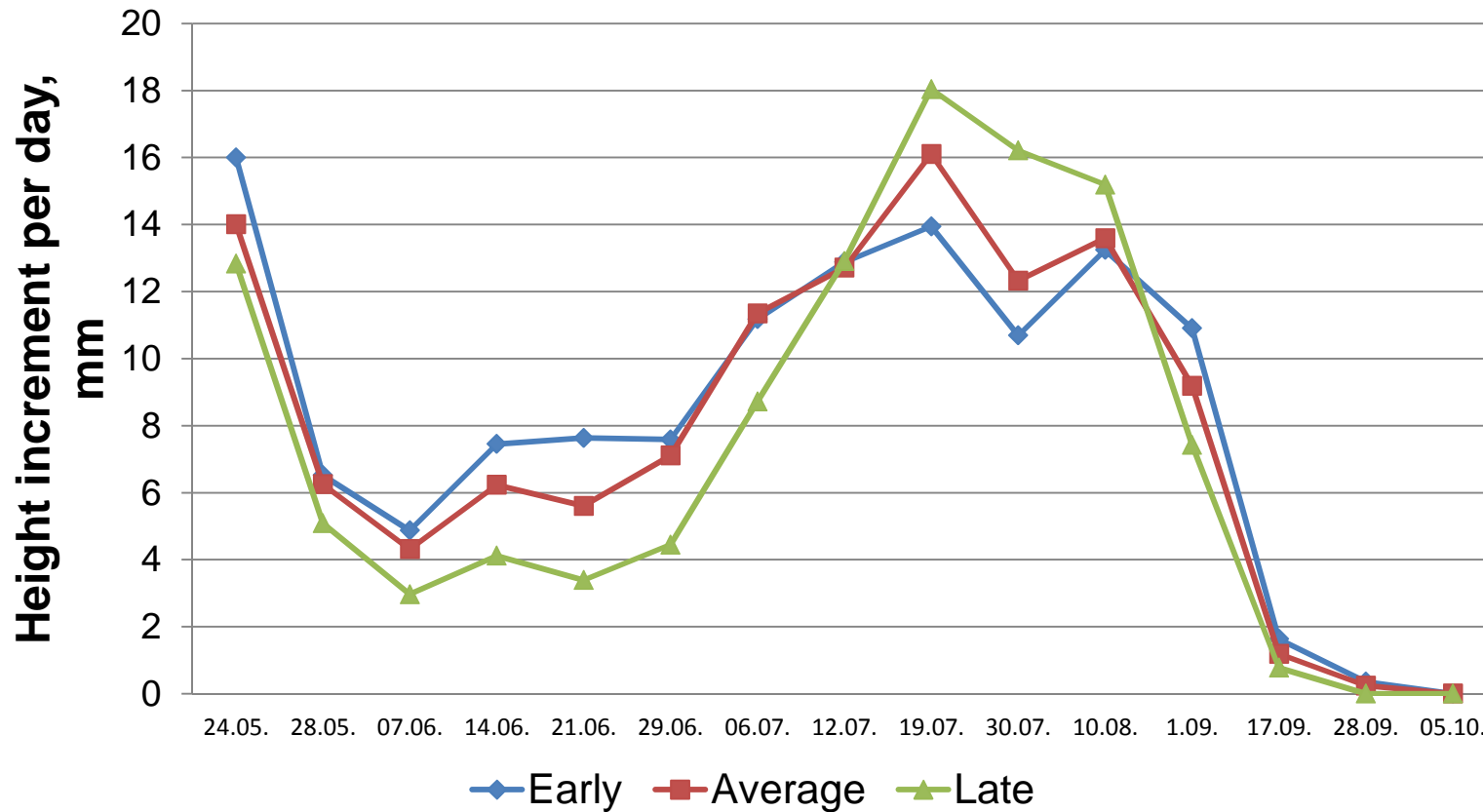
Strong significant correlation ( $r=0,87$ ) found between growth intensity and daily mean temperature.



# Growth

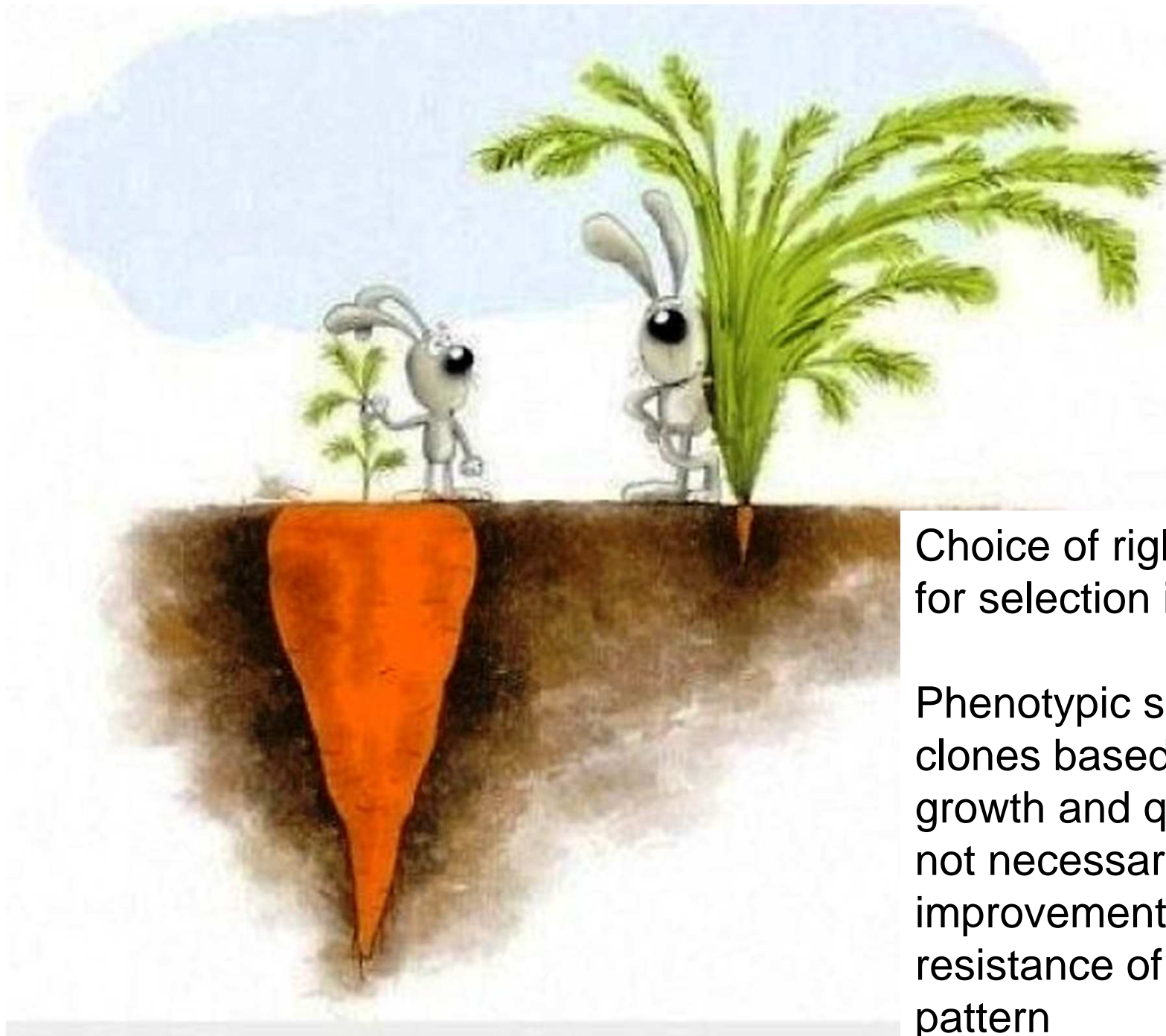


Slight differences among groups of clones and separate clones found





SILAVA



Choice of right trait(s)  
for selection is crucial

Phenotypic selection of  
clones based on height  
growth and quality does  
not necessarily yield an  
improvement of  
resistance of growth  
pattern



As there are uncertainties in predictions any last-minute changes in deployment zones of seed orchard progenies can (shall) be made just prior to their use in plant production



**Don't miss the target!**



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Study has been carried out in project  
“Importance of Genetic Factors in  
Formation of Forest Stands with High  
Adaptability and Qualitative Wood  
Properties” (Contract Nr.  
2009/0200/1DP/1.1.1.2.0/09/APIA/VIAA/146)



With the inspiration  
from and discussion  
within COST network

**Thank You !**

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