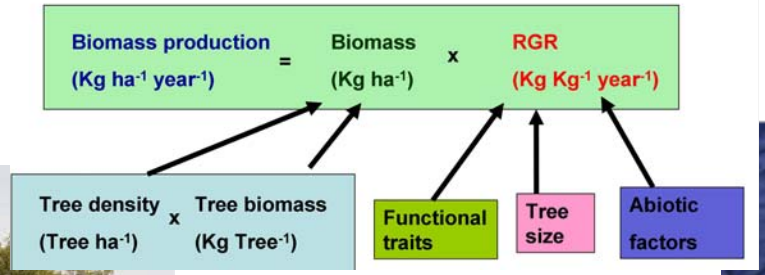
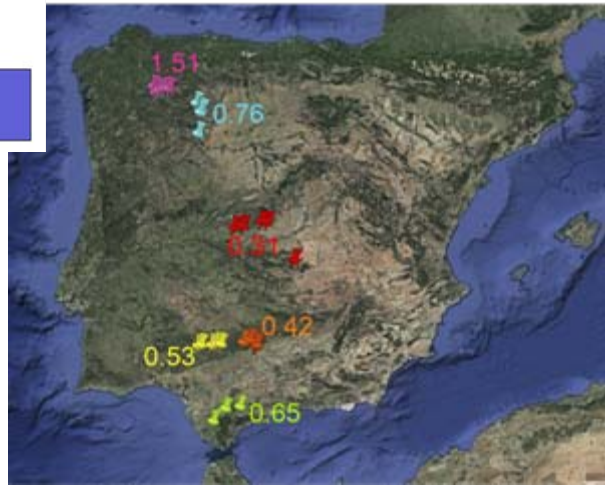
Intraspecific trait variation and abiotic factors as predictors of biomass production in *Quercus ilex* forests along an aridity gradient

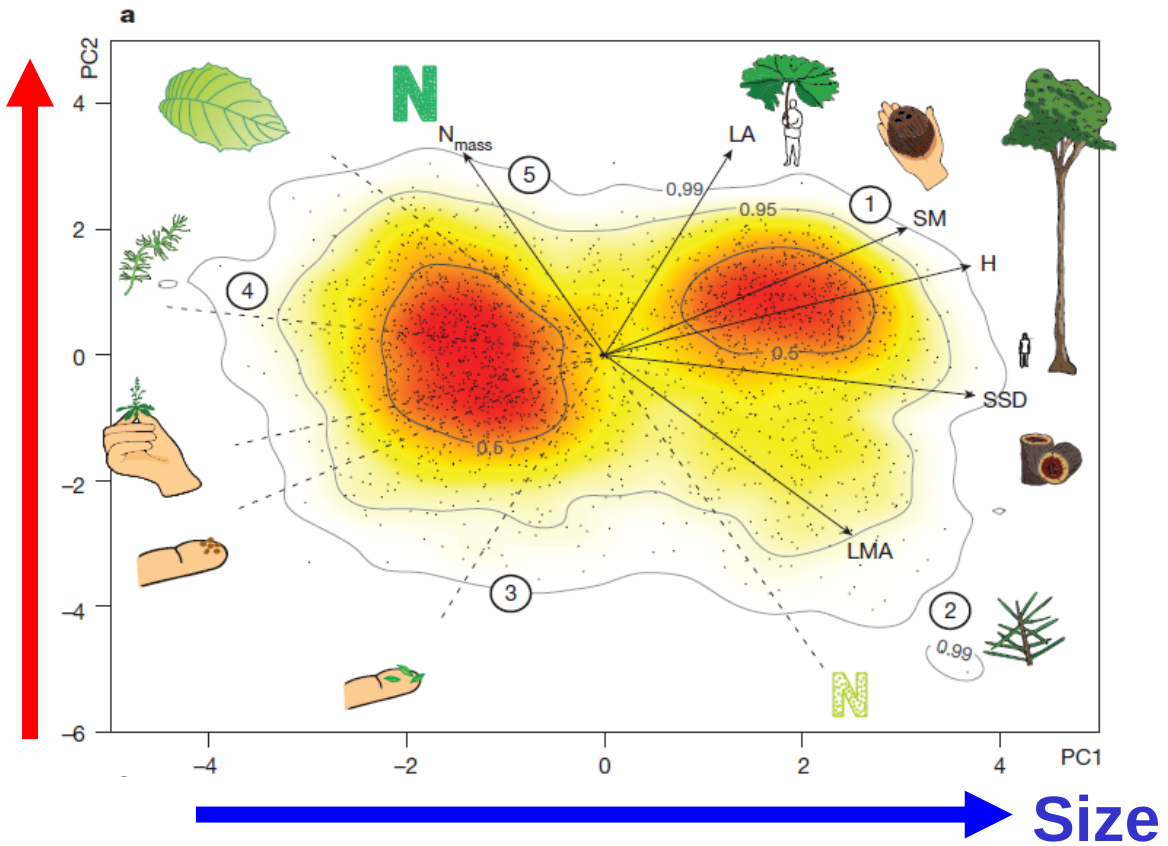
Rafael Villar, Manuel Olmo, Pablo Salazar, Manuel Sanchez, Salvador Arenas, Paloma Ruiz-Benito





Plant trait variation

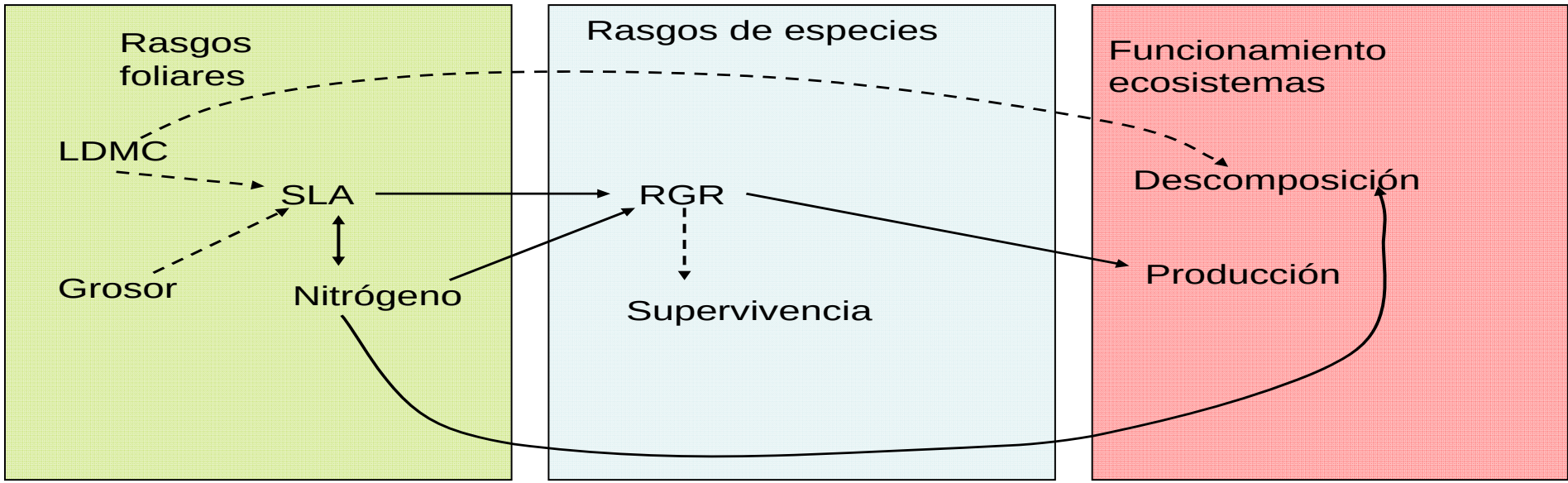
Leaf Economics Spectrum



Diaz et al. (2016) Nature

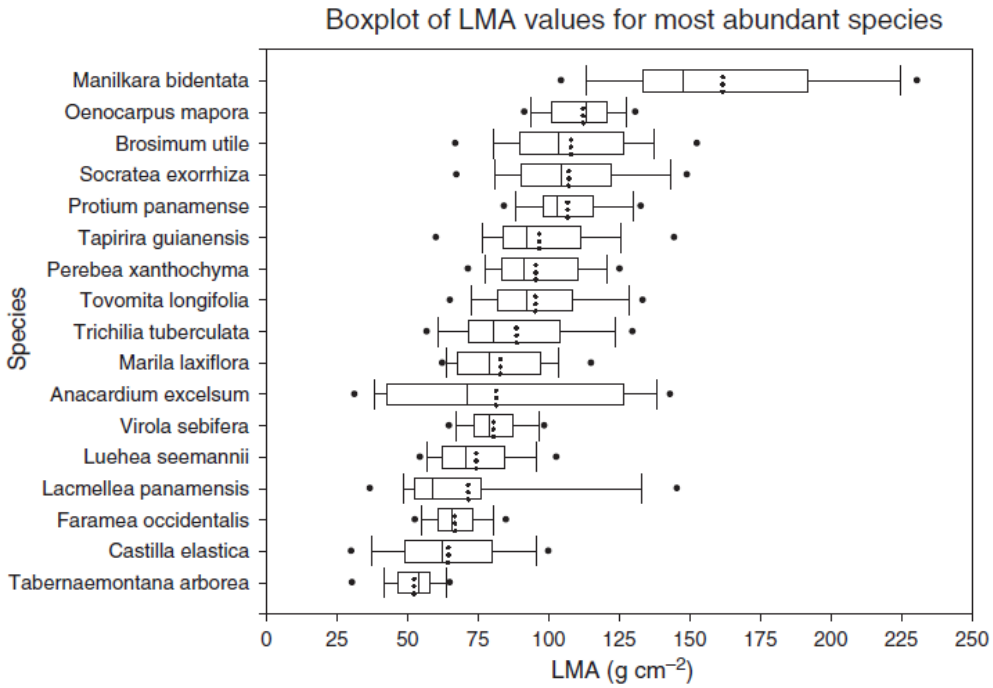
These two axes absorb 75 % of variation

Influence of Functional trait variation on plant fitness and ecosystem function



Study with Different species

Intraspecific trait variation



Leaf shapes in Mediterranean species

Messier et al. (2010) Ecology Letters

Wide intraspecific trait variation

Is this variation important for plant functioning?

Growth and functional traits

Growth in large trees ???

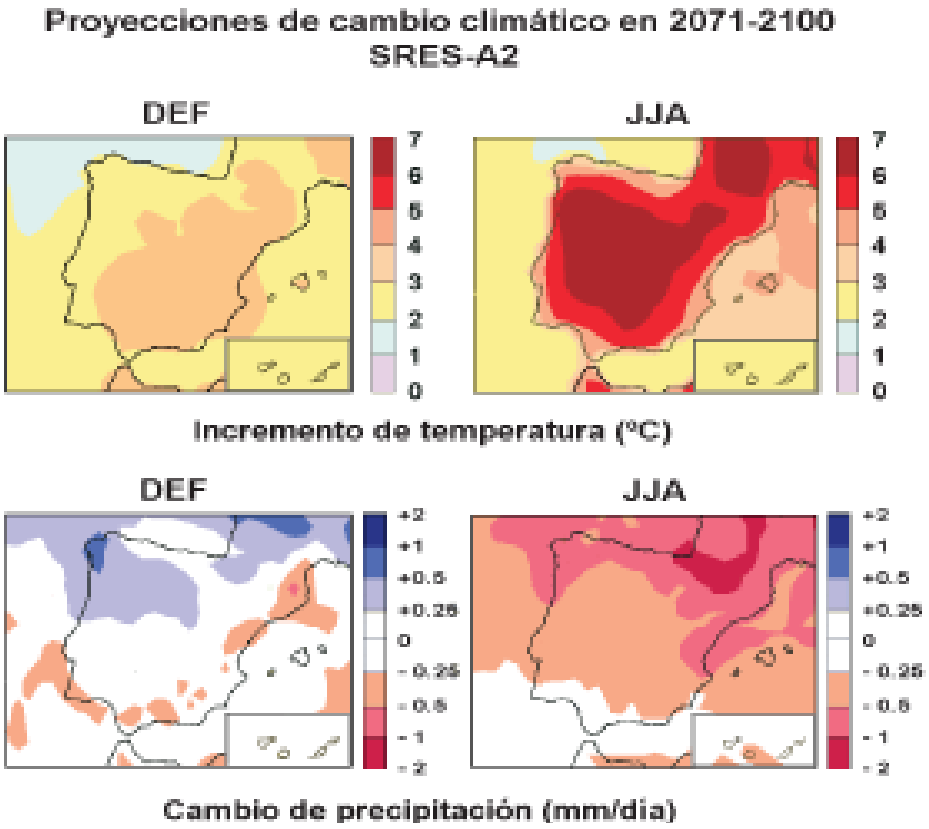
Opinion

Detecting trends in tree growth: not so simple

David M.J.S. Bowman[1], Roel J.W. Brienen[2], Emanuel Gloor[2], Oliver L. Phillips[2], and Lynda D. Prior[1]

Bowman et al. (2013) Trends in Plant Science

Climate Change will affect Mediterranean ecosystems

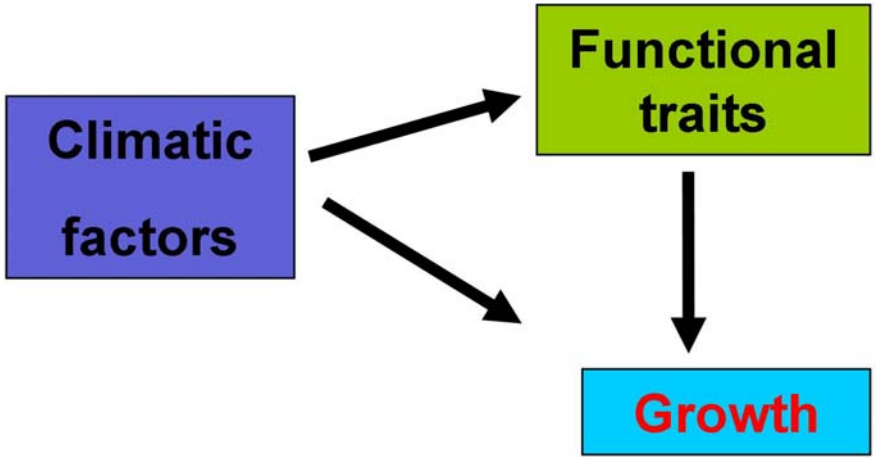


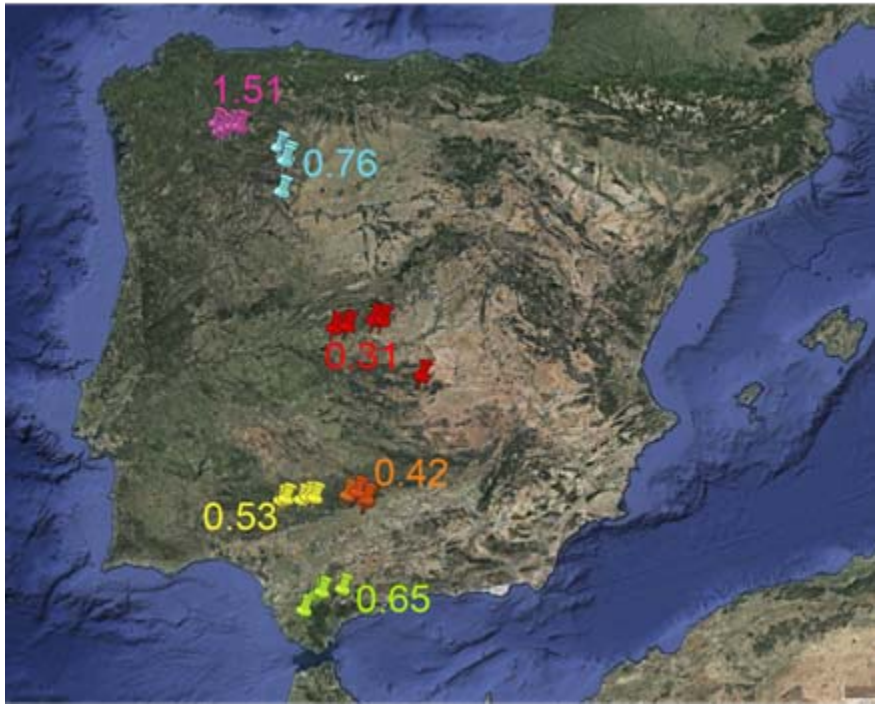
Principales Conclusiones
de la Evaluación Preliminar
de los Impactos en España por
Efecto del Cambio Climático

Increase in aridity

Objetives

Intraspecific study





Quercus ilex spp ballota

Inventario Forestal Nacional (IFN)

6 zones with different Aridity Index (PP/ PET)

5 plots per zone

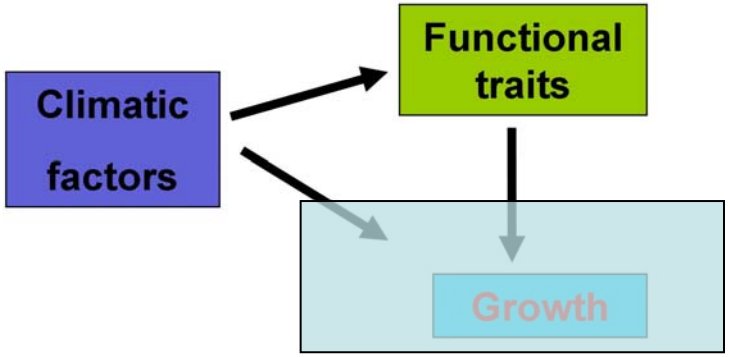
5-7 trees per plot

LMA, thickness, dry matter content

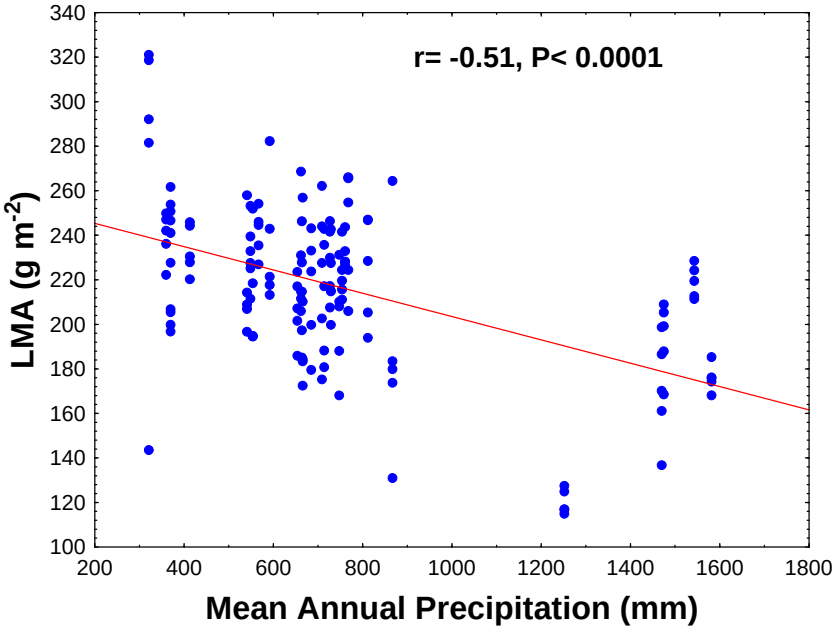
Growth of trees (allometric equation based in DBH), Defoliation

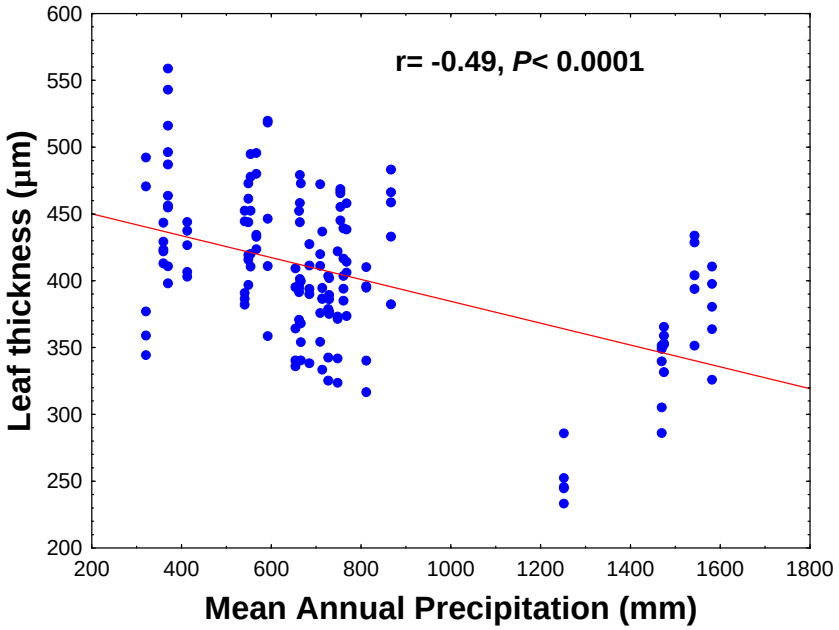
Shrublands: Functional traits, cover

Influence of aridity on functional traits



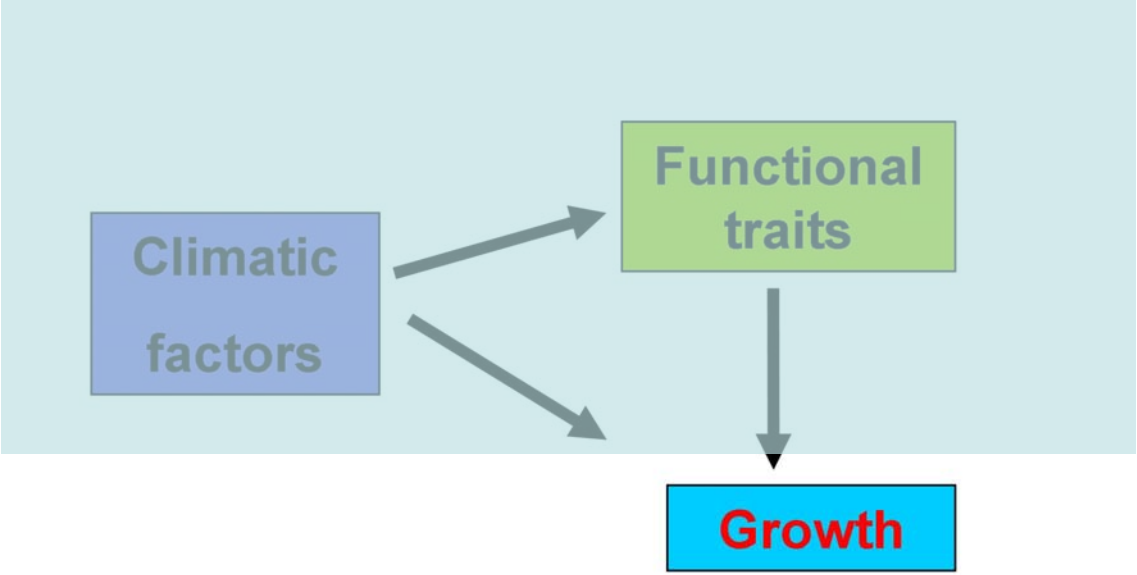
Quercus ilex spp ballota





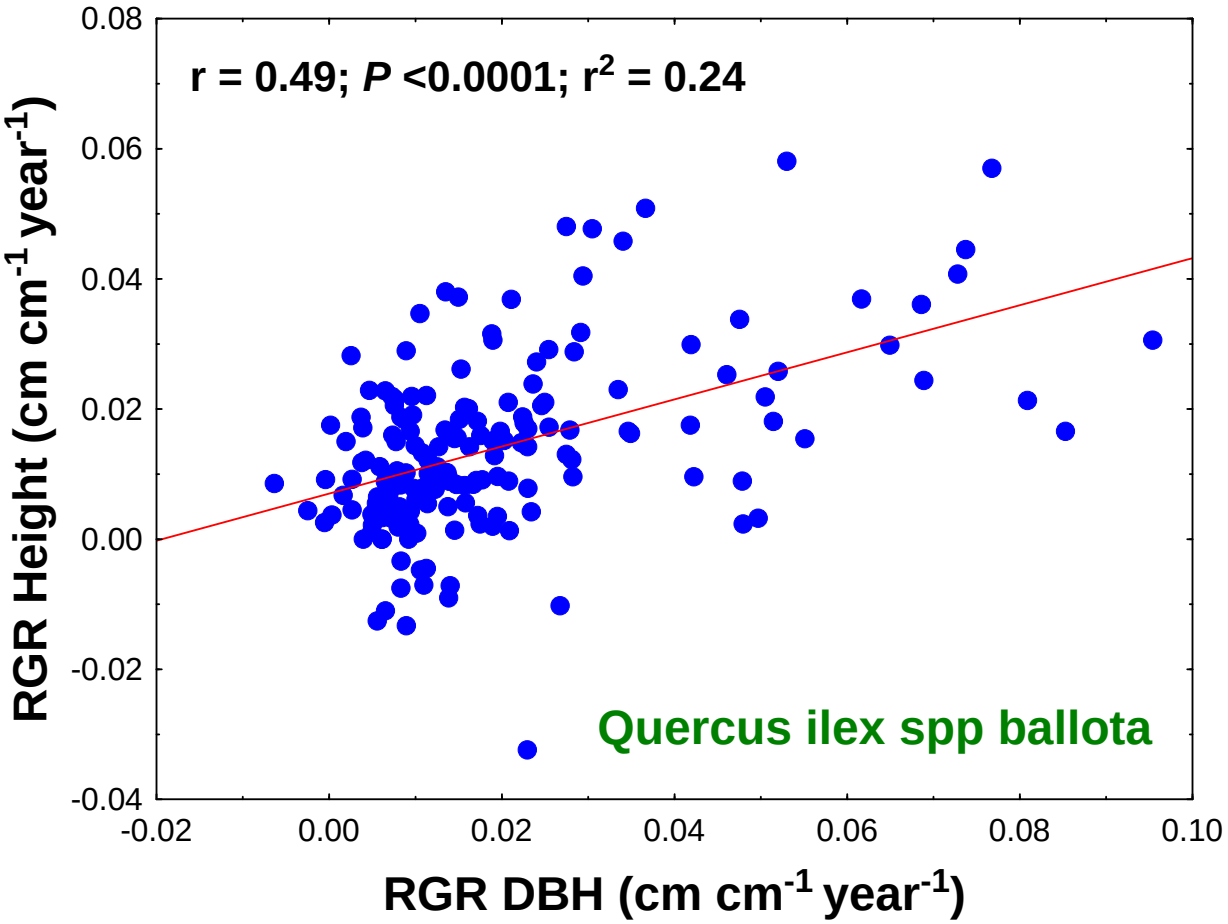
High LMA and thickness with low precipitation

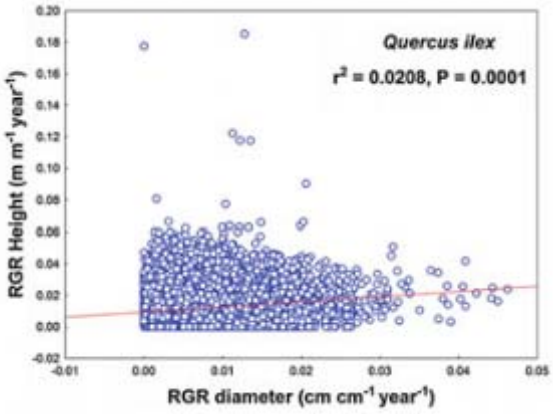
How to measure tree growth?



Increase in DBH, in Height?

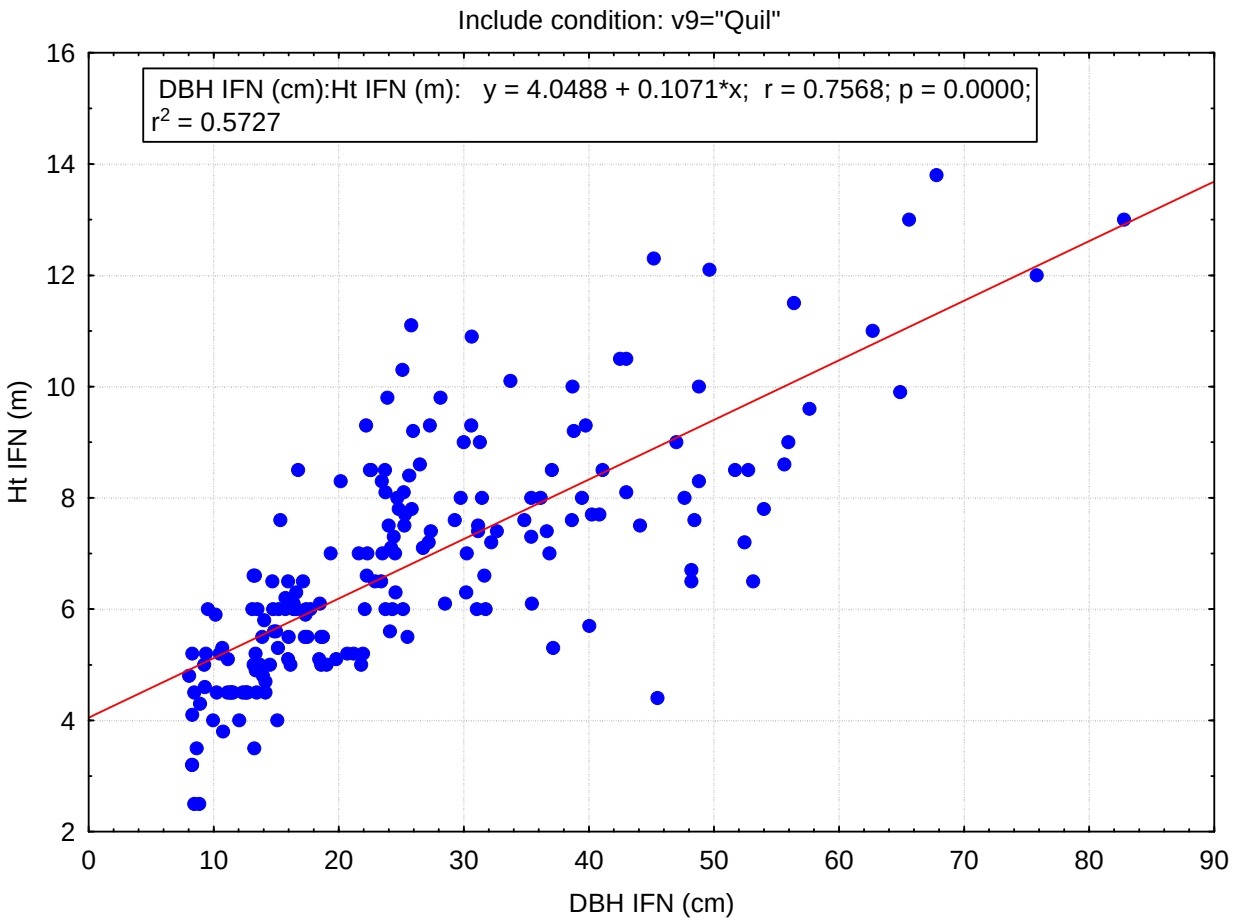
Growth in heigth versus DBH



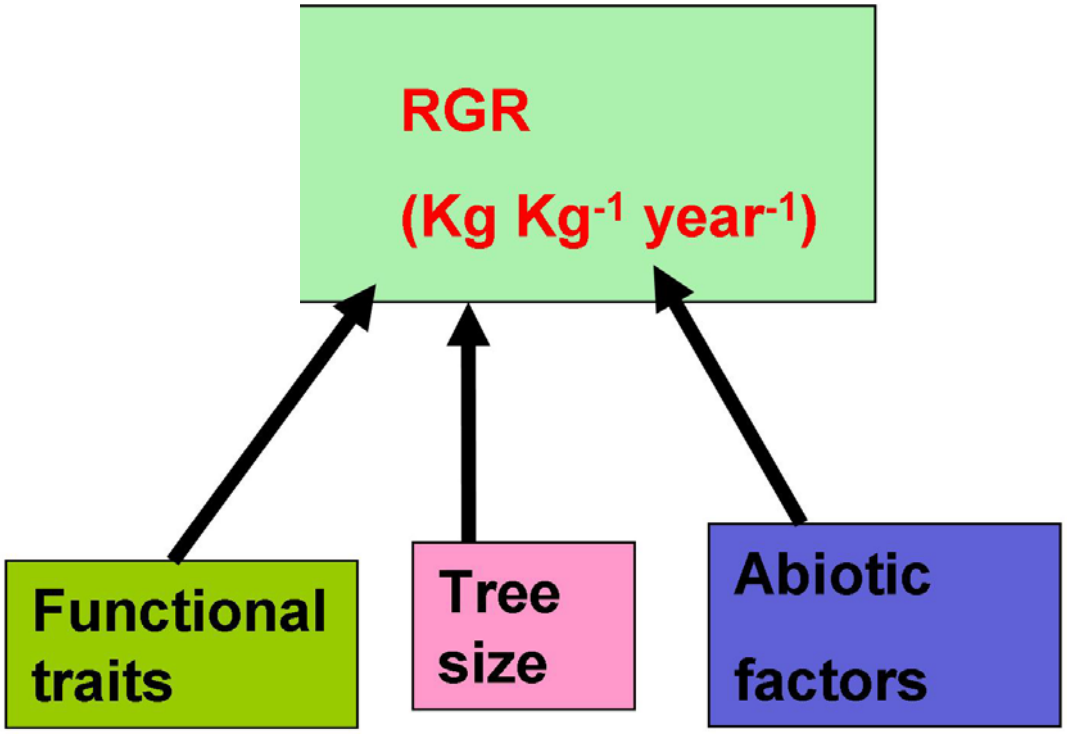


RGR based in DBH poorly related to RGR height, both should be taken into account

Relation DBH - altura

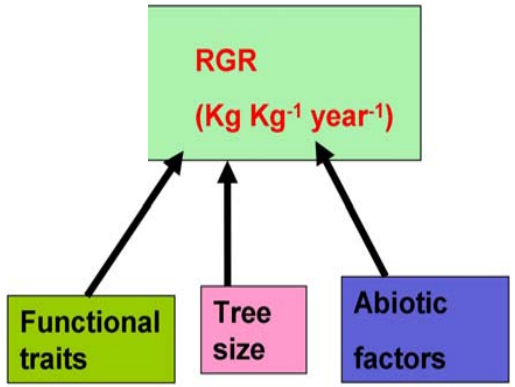


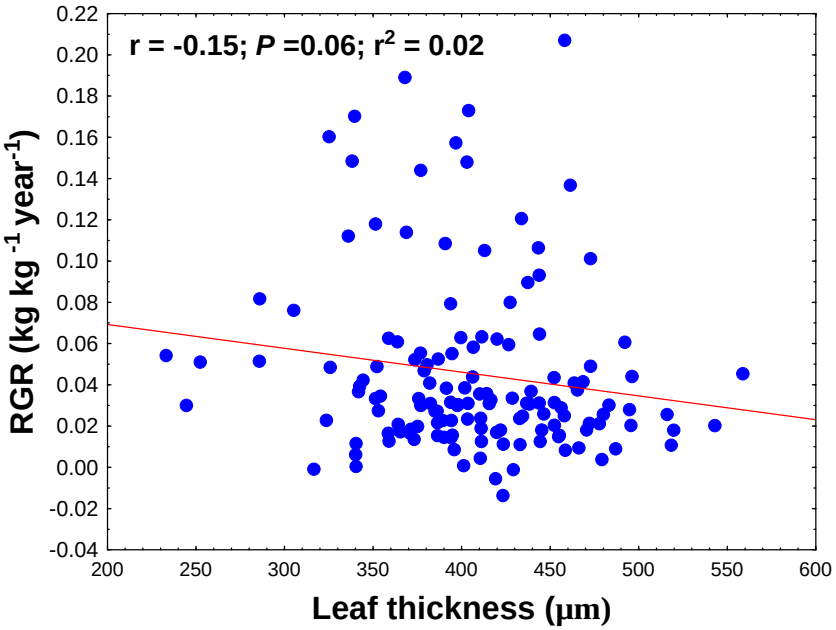
Factors affecting tree growth

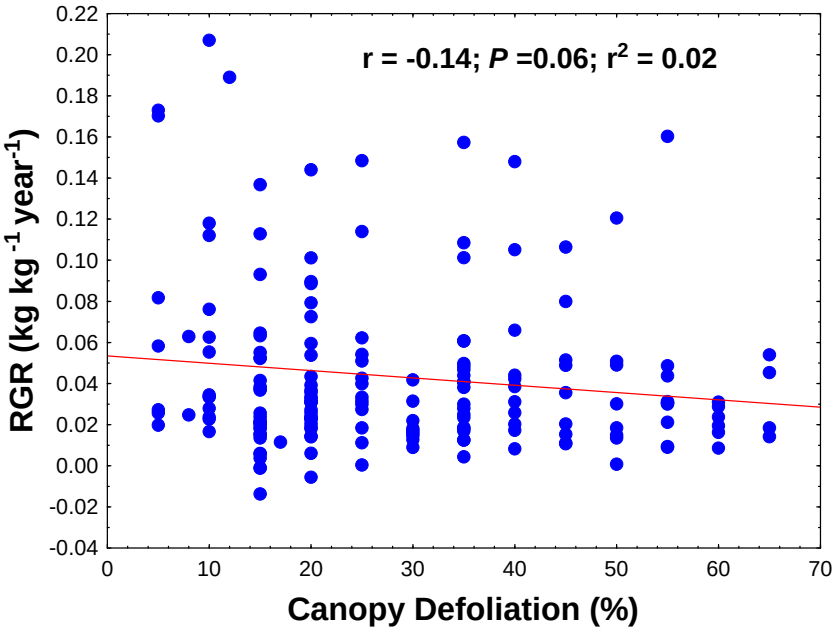


Factors affecting tree growth

Functional traits and defoliation



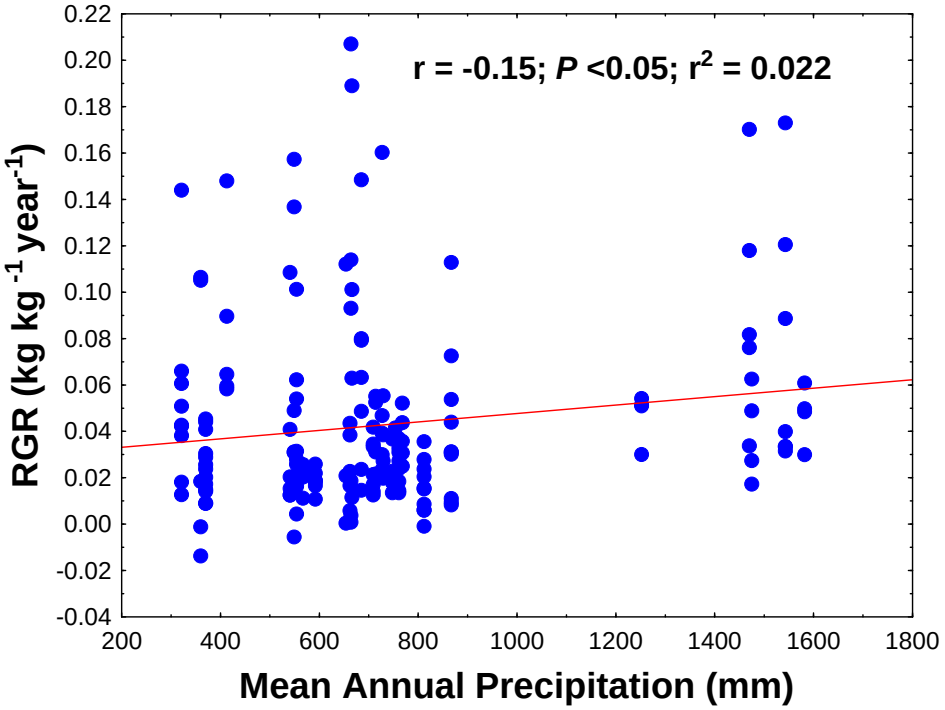


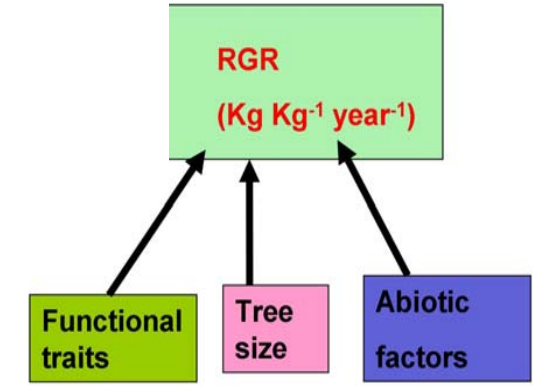


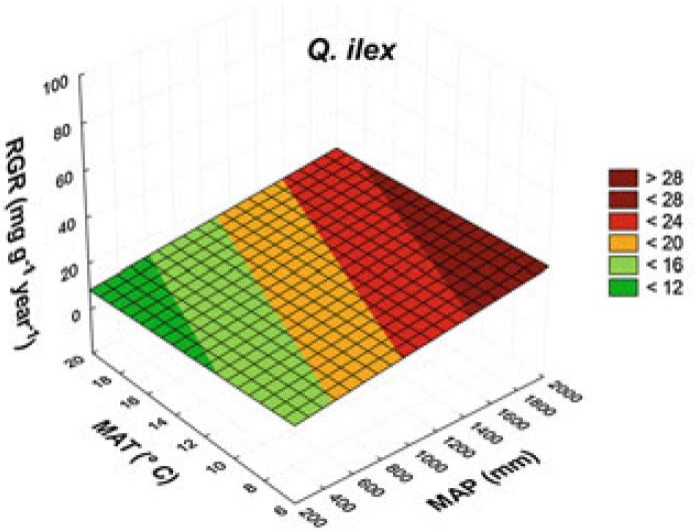
Negative effect of leaf thickness and defoliation, but low

Factors affecting tree growth

Climatic factors



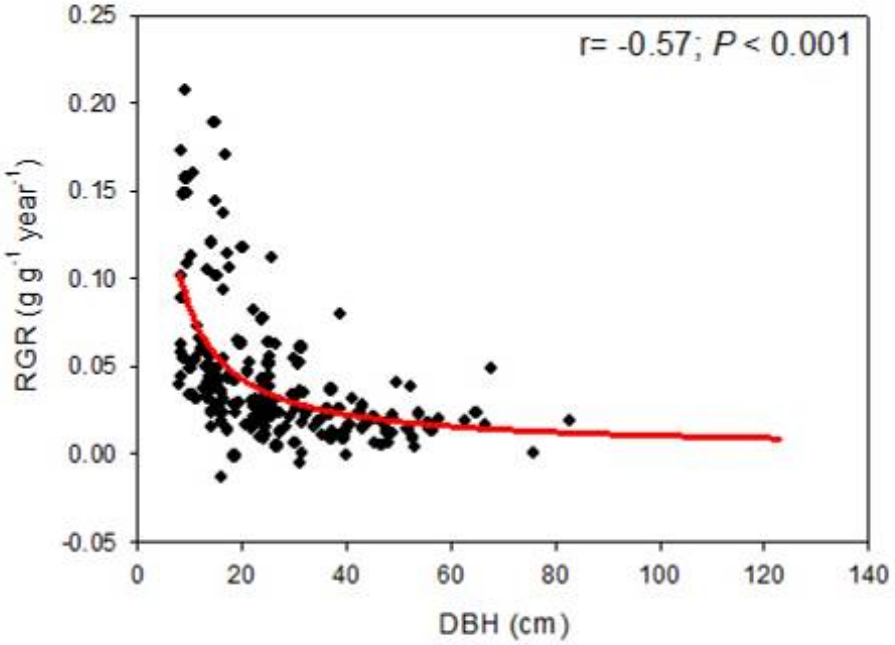


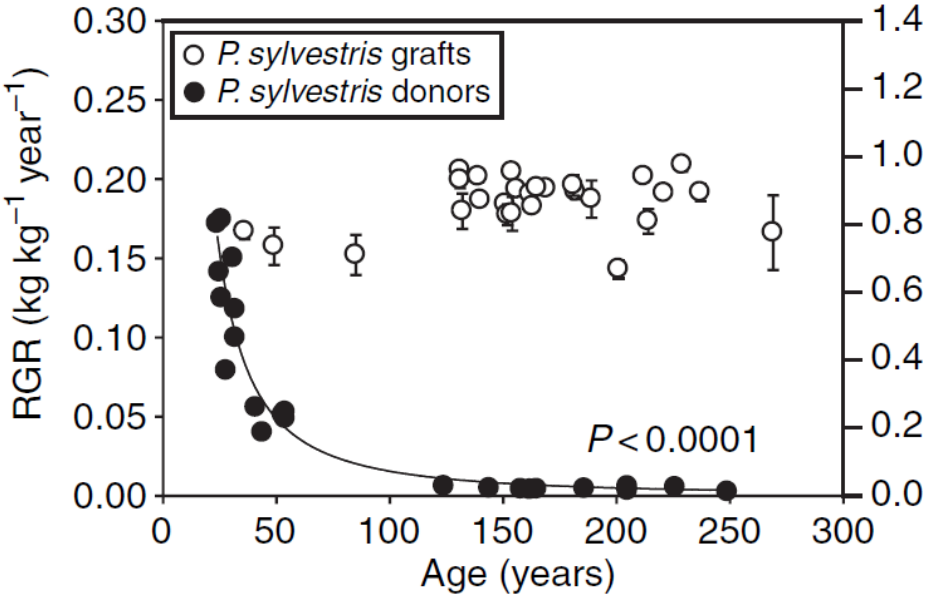


Negative effect of aridity, but low

Factors affecting tree growth

Tree size

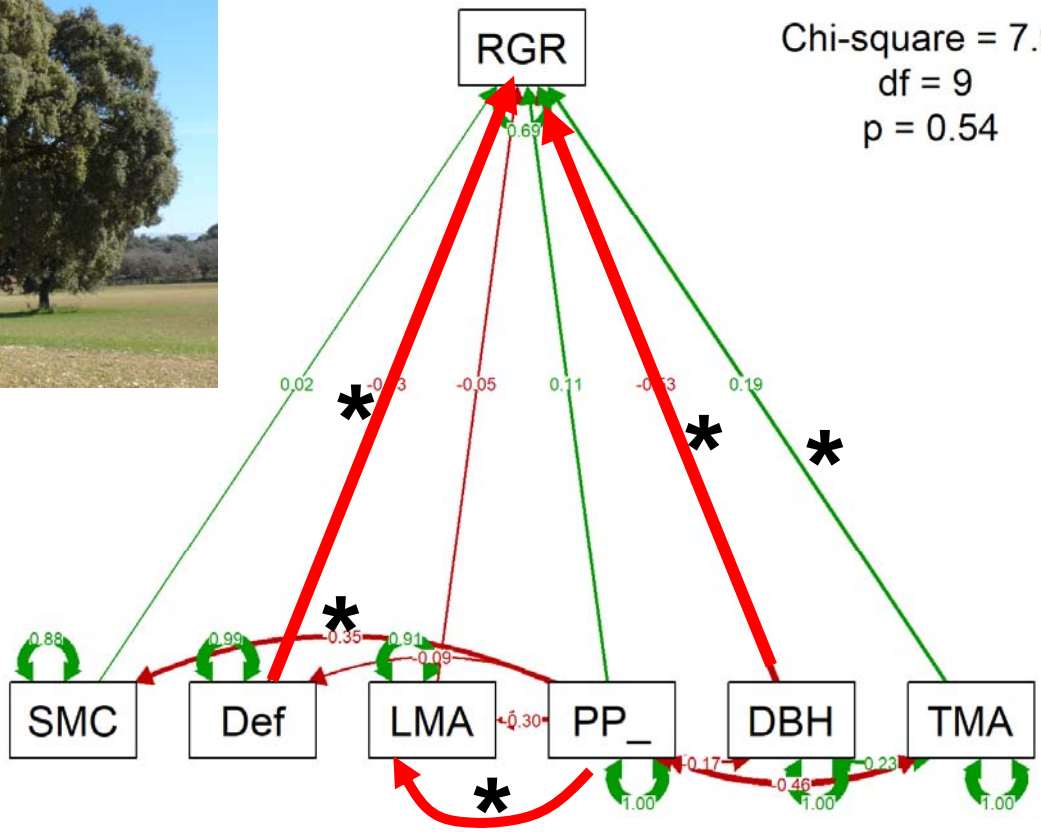




Mencucinni et al. (2005) Ecol. Let

Big trees grow slower

Tree growth
(Structural Equations Model)



Forest Production

Biomass production (Kg ha^{-1} year^{-1}) = **Biomass** (Kg ha^{-1}) x **RGR** (Kg Kg^{-1} year^{-1})

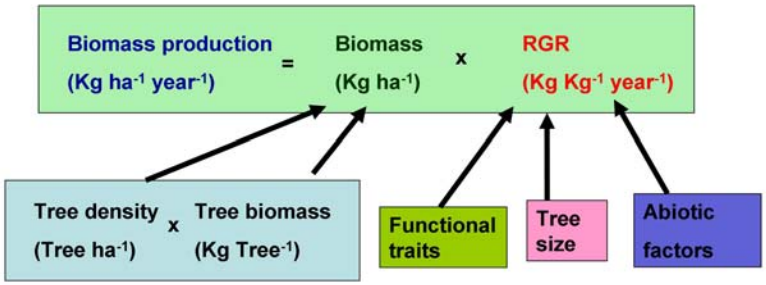
Tree density (Tree ha^{-1}) x **Tree biomass** (Kg Tree^{-1})

Functional traits

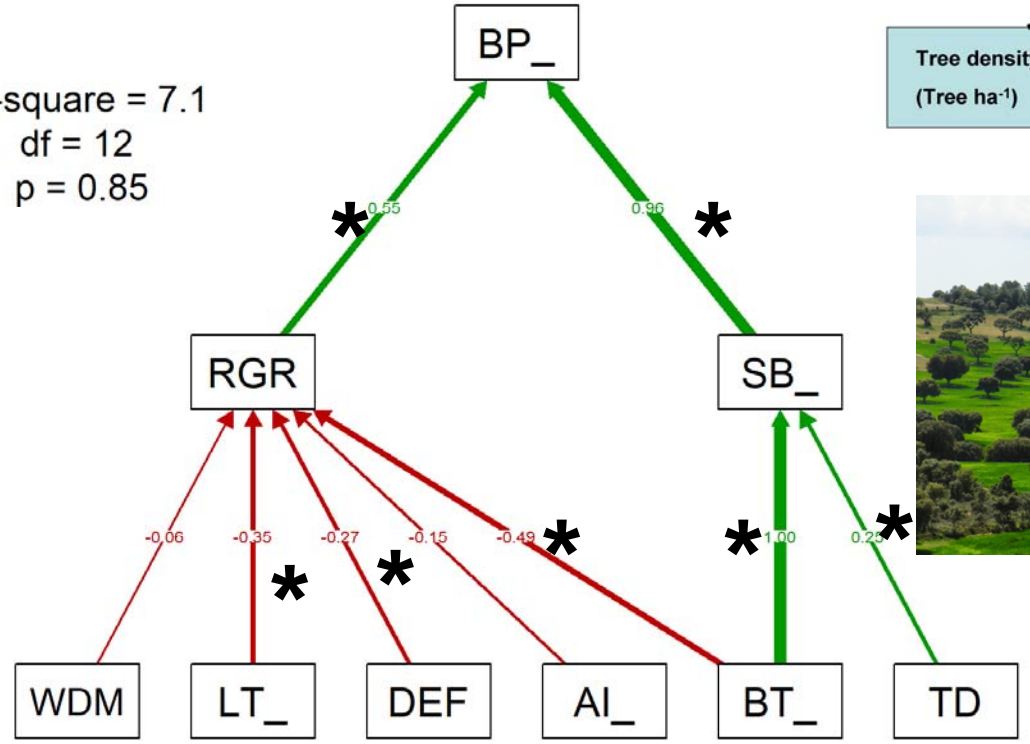
Tree size

Abiotic factors

Forest Production

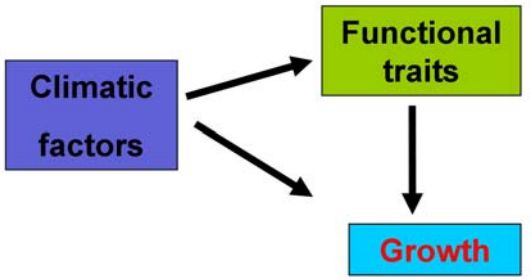


Chi-square = 7.1
df = 12
p = 0.85



Forest production is mainly due to Stand Biomass and also to RGR

Conclusions



- **High LMA and thickness with low precipitation**
- **RGR based in DBH poorly related to RGR height, both should be taken into account**
- **RGR was negative affected by leaf thickness, aridity and defoliation, but low effect**
- **Big trees grow slower**
- **Forest production is mainly due to Stand Biomass and also to RGR**