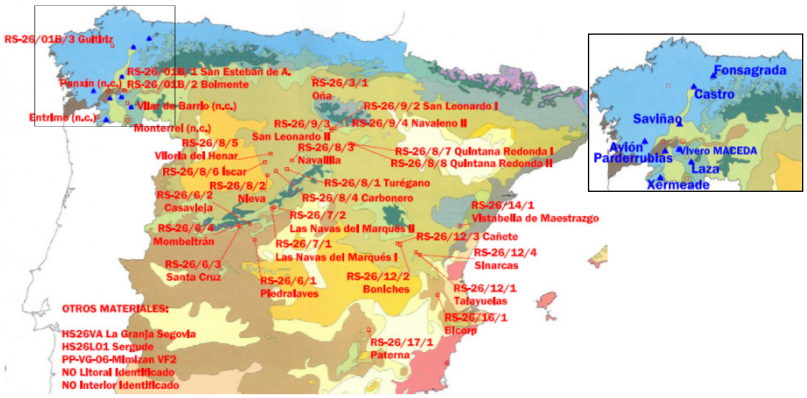
CONSTRAINTS IN THE ALLOCATION TO GROWTH, DEFENCES AND TOLERANCE TO FROST STRESS IN MARITIME PINE

LARIO, FJ[1], ZAS, R[2], SAMPEDRO, L[2], CHAMBEL, R[3]

[1] Empresa de Transformación Agraria SA. TRAGSA Ctra. Maceda-Valdrey km 2 32708 Maceda Spain flario@tragsa.es
[2] Misión Biológica de Galicia-Centro Superior de Investigaciones Científicas CSIC-MBG C/Carballeira 8 Salcedo Pontevedra. E-36143 Spain
[3] Centro de Investigación Forestal-Instituto de Investigación Agraria CIFOR-INIA Madrid Spain

Introduction & Objectives

Phenotypic characterization of forest reproductive material (FRM), i.e. provenance, is a clue step to established recommendations of use. Lately these recommendations should be founded not only on growth but for others vital functions for survive and regeneration. Within these are resource allocation to mechanisms protecting from biotic antagonists and needle frosting. In the present work relationships of growth parameters with constitutive defenses and frost sensitivity are studied in a collection of *Pinus pinaster* Ait. provenance proposed for testing in Interior Climate of Northwestern Spain.



Location of tested provenances (in red) and field trials (in blue) on Spanish plant-climatic subregions map (Allué, 1990, modified in García del Barrio *et al,* 2001)

Conclusion: Provenances originating from the coastal areas allocated more resources to defence against foliar pathogens and herbivores and showed more frost tolerance and reduced diameter growth and increased height growth. On the other hand, Mediterranean and Continental provenances, originating from Central Spain were more sensitive to autumn frost but showed low concentrations of chemical defences in the needles that may led them more susceptible to biotic damage.

Methodology

GROWTH

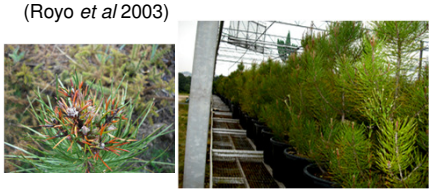
25 provenance
8 field trials
48 plants by provenance and field trial
6 Year-old
Height and basal diameter

ALLOCATION TO CHEMICAL DEFENCES

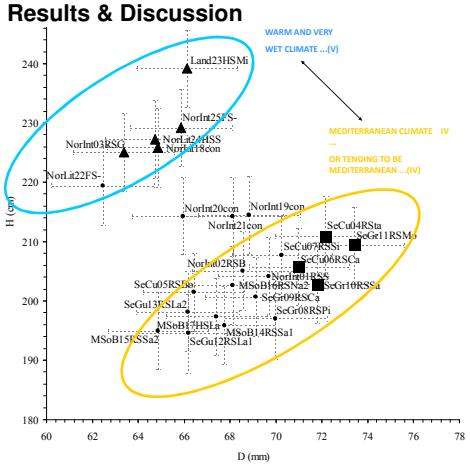
10 provenance
2 field trials
12 plants/provenance & field trial
7 Year-old
Concentration of non-volatile resin in the needles

TOLERANCE TO FROST

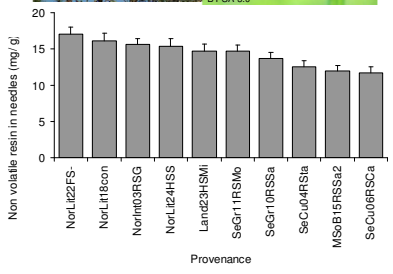
25 provenance
1 nursery trial in cultivated in 30 l pots
9 plants/provenance
4 Year-old
4 samples of adult needles formed from 3 plants of the same experimental unit & block
Frost sensitivity to -16 ºC by electrolite leakage in an artificial frost tolerance test (Royo *et al* 2003)



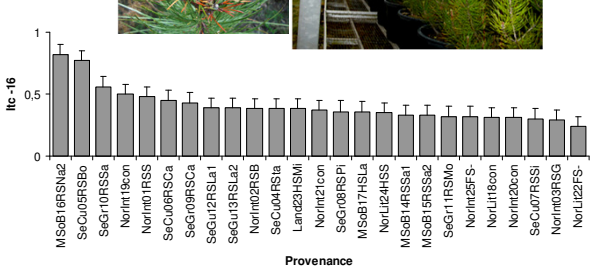
Results & Discussion



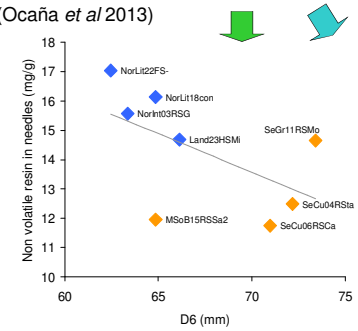
Significant provenance differences in height, H, and diameter, D, ($p<0,001$;$p<0,05$) at 6 year-old in 8 field trials net in Northwestern Spain confirming segregation between coastal and non coastal climates (Ocaña *et al* 2013)

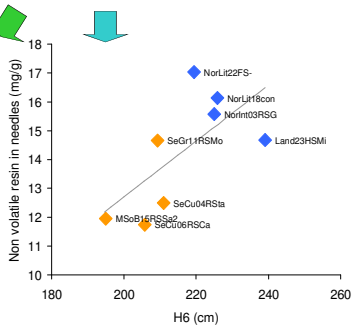


Significant difference ($p<0,001$) of non volatile resin concentration in needles in 8 years old provenance evaluated in 2 field trials (Xermeade & Fonsagrada)

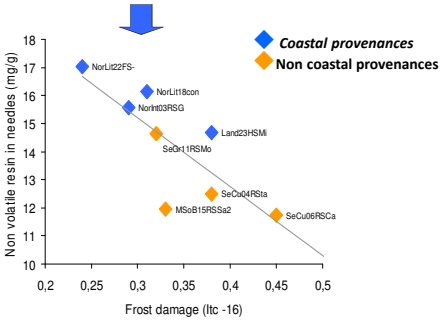


Marginal effect of provenance ($p=0,113$) on needles-of-the-year frost damage, Itc-16, collected in autumn.





Non volatile resin in needles and growth parameters, 6 year-old diameter and height, showed marginal relationships at provenance level (for diameter: $r=-0,59$; $p=0,12$;$n=8$; for height: $r=0,66$; $p=0,07$; $n=8$). Former resin-based needle defences increased in thinner and taller provenance.



Finally, a negative strong relationship was found at provenance level between non volatile resin in needles and frost sensitivity, Itc-16, ($r=-0,78$; $p=0,02$; $n=8$).

References: Royo, A, Fernández, M, Gil, L, Pardos, JA, 2003 Assessing the hardiness of Aleppo pine, maritime pine, and holm oak seedlings by electrolyte leakage and water potential methods. Tree Planters' Notes 50: 38-43; Ocaña, L, Chan, JL, Aboal, J, Lario, FJ, Rodríguez, L 2013 Red de ensayos comparativos de materiales de base de *Pinus pinaster* en el interior de Galicia. Evaluación a los 6 años de edad. 6º Congreso Forestal Español Vitoria-Gasteiz 10-14 junio; García, JM, de Miguel, J, Alía, R, Iglesias, S 2001 Regiones de Identificación y utilización de Material Forestal de Reproducción. MMA. Secret. General del Medio Ambiente. Dir. Gen. Conservación de la Naturaleza.

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