A TRANSPLANT EXPERIMENT OF TWO BIRCH SPECIES ALONG A LATITUDINAL GRADIENT OF THEIR NATURAL DISTRIBUTION RANGE

INTRODUCTION

The impact of global warming on forest ecosystems is one of the most demanding challenges faced by the environmental scientists today. Common garden and transplant experiments offer a powerful method for testing the response of tree species and their associated communities to climatic changes. In a transplant set-up, transfer towards lower latitudes mimics the shift to the future warmer climate and presumably higher herbivore pressure. To study the acclimation and adaptation capacity of two common birch species (Betula pendula and B. pubescens) to changes in their growth environment, we designed a multi-site, international transplant experiment, covering the entire latitudinal distribution range of both species.

PLANT MATERIAL AND FIELD SITES

Common gardens with identical set-ups will be established in summer 2016 on three locations (i.e., Florence, Italy, 43°, Punkaharju, Finland 61° and Kolari, Finland 67°) along the latitudinal gradient of B. pendula and B. pubescens distribution range (Figure 1, 2). At each location, soils were sampled in up to seven sites prior selecting two sites of contrasting soil fertility for the experiment (Figure 3). The plant material was cloned from adult trees randomly chosen from B. pendula and B. pubescens populations growing in North Finland 67° (Figure 2), South Finland 61° and North Italy 45° (five trees, or genotypes, from each location for both species). As the effects of soil and day length cannot be separated from the effects of warmer climate in transplant field experiments, we will test the effects of these factors on the growth of the saplings in separate laboratory experiments in the spring 2016.

HYPOTHESES

We predict that (1) due to higher inter-annual variation in growth conditions in the north, northern populations will better acclimate to new environments than southern populations, (2) acclimation will be easier in nutrient rich than nutrient poor soils (a soil × climate interaction), (3) due to alien herbivore species, leaf damage will increase in foreign environments (although relatively more in southern translocation), (4) nitrogen cycling rate will increase, thus promoting productivity, in southern translocation due to accelerated leaf litter decomposition, and (5) in both species, the populations will have significant genotypic variation, enabling their adaptation to the future climatic change.

INVITATION

To make good use of the field trial, we are interested in co-operation and seek for scientists interested in complementing our research approach and the field measurements starting in summer 2016.