PREDICTING GERMINATION CAPACITY OF SCOTS PINE AND NORWAY SPRUCE SEEDS USING TEMPERATURE DATA FROM WEATHER STATIONS

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INTRODUCTION

In Fennoscandia both Scots pine and Norway spruce often fail to produce mature seed, especially in the northern parts. In order to maintain sustainable multi purpose forestry cone and seed crop predictions are important. To determine if the seed crop is good enough for cone collection or natural regeneration, there is a need of early, large scale predictions of germination capacity. Identification of larger areas, regions, with good or bad conditions for seed maturation is important in an effective planning of both cone collection, soil treatment for natural regeneration, and to be able to concentrate the sampling on stand level to areas with the best conditions.

In Sweden the present method to predict germination capacity of Scots pine *(Pinus sylvestris L.),* on a large scale, is based on the temperature for the months June until August (Alfjorden and Remröd, 1975). The method needs improvement since the predictions may be inaccurate, especially for years with high temperature during early spring. Functions for Scots pine are used also for Norway spruce *(Picea abies (L.)* Karst.), even though Norway spruce may have lower temperature requirements for producing mature seed than Scots pine (Wennström and Almqvist, 1995).

MATERIAL AND METHODS

Cone samples used for obtaining seed germination data for this investigation were collected from natural stands throughout Sweden during 1971-1994. Data from 1297 Scots pine and 597 Norway spruce stands were used. The altitude of the stands varied between 5 and 700 m.a.sl. and the latitude varied from 55° 25' N and 68° 30' N for both species. All germination analyses were made immediately after the cones were collected and extracted. Number of seeds analysed was 300 (250-400). Seed samples with more than 50% seeds damaged by insects were excluded.

Daily mean temperature data from 71 stations of The Swedish Meteorological and Hydrological Institute (SMHI) were used. To each stand a temperature regime from the closest SMHI station was assigned. Temperature sums, d.d., with threshold values of +4° - +10°C were calculated from the start of the growing season until August 31 and

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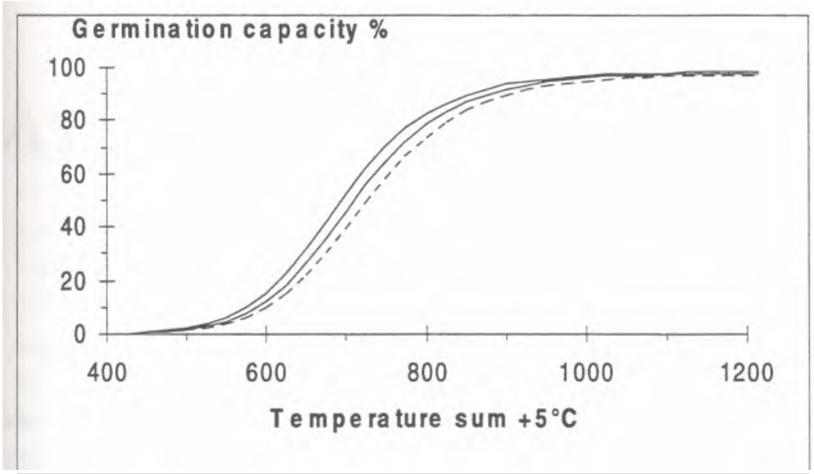

Figure 2. Response curves of the Scots pine function including the variable NumD (time from fertilisation to embryo growth cessation). Solid line is NumD=65, dashed line is NumD=70 and dotted line is NumD=75.

The time of fertilisation and consequently the time for the seed and embryo to grow and mature varies between years at the same locality. We used a rough estimate for this, in absence of more detailed information. A more correct way to calculate the time variable would probably improve the model.

CONCLUSIONS

It seems appropriate to use accumulated temperature sum (+5°C) from start of growing season until August 31 in combination with number of days from estimated fertilisation time until approximate time for embryo growth cessation as parameters in a function for predicting germination capacity of Scots pine and Norway spruce on a large scale.

Our functions show that Norway spruce has a lower temperature sum requirement for producing mature seed than Scots pine.

The presented functions could be used to identify regions with low or high risk of having weather conditions unfavourable for seed maturation.

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