Signals from beech (Fagus sylvatica L.) in response to precipitation extremes - flowering induction and reduced foliation

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Signals from beech (*Fagus sylvatica* L.) in response to precipitation extremes – flowering induction and reduced foliation

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Abstract :

Reduced foliation in older (but also young) beech (*Fagus sylvatica* L.) stands was observed in Denmark in the mid 1990ies and culminated with the 1996 summer drought and heat wave. Large differences in the degree of reduced foliation between regions and within stands were observed e.g. reflecting stand structure and exposure.

An analysis of monthly precipitation and temperature data from 1873-1996 in south-eastern Denmark revealed that the series of summers with low precipitation in 1994-1996 was rare but not unprecedented (Figure 1).

The precipitation data were compared with a data series of mast years (classes ranging from 1~no mast to 4~maximum mast production, Figure 2) showing that widespread flowering in beech occurred when the summer in the previous year had been warm and dry (Figure 3), and when a favorable growing season occurred two years prior to the mast year in terms of higher than average precipitation and lower than average temperature during june, july and august.

The different response could also be related to site factors that prevented deep and permanent rooting due to occasional lack of soil aeration. The permanent rooting depth should be devoid of signs of stagnant water (gley and severe pseudogley) caused by poor internal drainage (Figure 4) and minor depressions in micro relief .

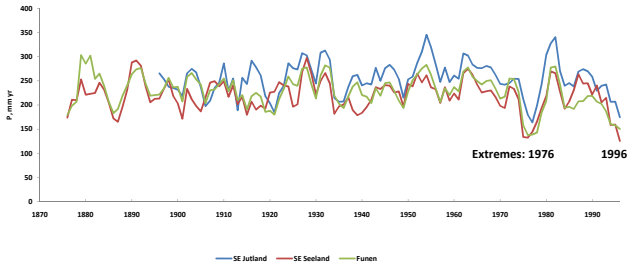

Figure 1. Summer precipitation (may-aug), 3-yr averages in three regions of Denmark. Two extreme series of dry summers occured in the mid 70ies and mid 90ies.

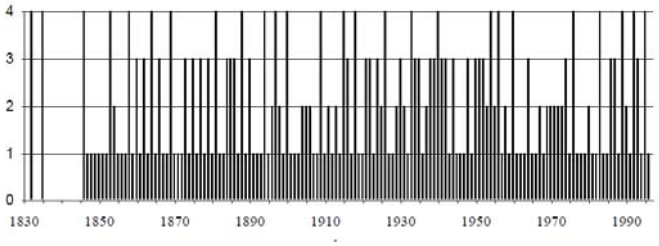

Figure 2. Mast production from the year 1832 to 1996. 1~no seed production, 2, 3.. to 4~maximum mast (seed) production.

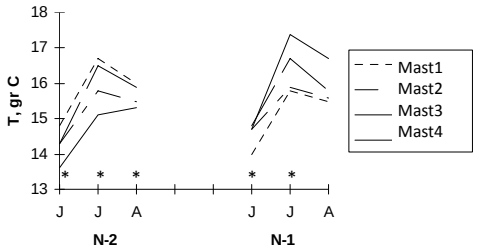

Figure 3. Mean monthly temperature one (N-1) and two (N-2) years prior to mast year in June, July and August . Four mast classes: 1~no mast, 2~ scarce mast 3 ~ abundant mast, 4~maximum mast. *~significant correlation with mast class (P<0.05).

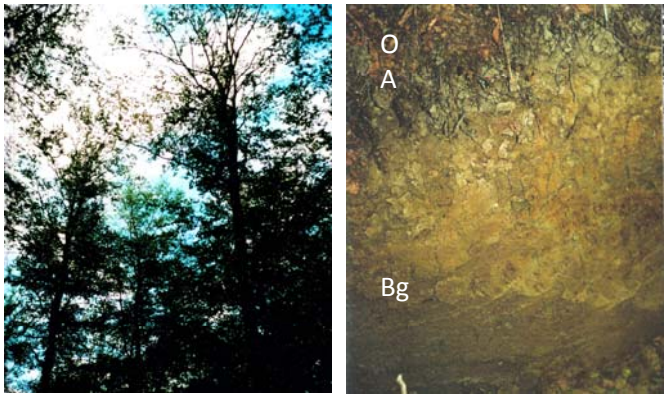

Figure 4. Beech stand with reduced foliation on clay soil with poor internal drainage (clay soil with pseudogley and gley).

Reference: Callesen, I. 1996. Drought effects in Beech - investigation of defoliation and soils in four thinning trials and analysis of climate and flowering over a period of 120 years. (In Danish). Master thesis, The Royal Veterinary and Agricultural University, Copenhagen.