

Reproductive Biology and Population Genetics of Common Ash (*Fraxinus excelsior* L.)

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Akademisk avhandling för filosofie doktorsexamen i naturvetenskap med inriktning mot biologi, som enligt naturvetenskapliga fakultetens beslut kommer att offentligt försvaras fredagen den 8:e april 2011, klockan 10.00 i Hörsalen, Institutionen för Växt- och Miljövetenskaper, Carl Skottsbergs gata 22B, 413 19 Göteborg. Examinator: Prof. Nils Hallenberg. Fakultetsopponent: Prof. Erik Dahl Kjær, Köpenhamns universitet, Skov & Landskab, Kongevej 11 2970 Hørsholm, Danmark.

ISBN: 978-91-628-8247-1

Dissertation Abstract

Grazyna Bochenek (2011). Reproductive Biology and Population Genetics of Common Ash (*Fraxinus excelsior* L.).

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Common Ash, *Fraxinus excelsior* L. (Oleaceae) is a wind-pollinated, wind-dispersed, deciduous tree, commonly occurring throughout Central and Northern Europe. The thesis addresses several questions concerning reproductive biology and factors influencing the genetic richness of ash stands. The breeding system is characterised in morphological terms as polygamous. However, individuals can be described as male, or seed producing hermaphrodites and females. The gender-related differences in vegetative growth were investigated on the branch level using dendrochronological techniques. The radial growth of male and female individuals turned out to be similar in a long-term perspective, but males invested more in building up their crown biomass. Genders responded also to different climatic variables. To determine the conditions for male gametophyte competition, a series of controlled pollinations were conducted and the pollen tube growth in naturally pollinated pistils was observed. As many other temperate trees, fertilization is delayed in *Fraxinus* and the pollen tube growth is arrested in the style. The results showed that the trait does not play any role in prezygotic selection in this species. The order of pollen grain arrival and, thus, flowering phenology was more important for paternity success than pollen tube growth performance. Furthermore, the functional breeding system of *F. excelsior* was examined. Hermaphrodite individuals were shown to have very low male fecundity and so could be classified as functionally female.

To test the effect of maternal flowering phenology on mating distances and genetic variability of their progeny nuclear microsatellite markers were employed on early and late flowering individuals. Additionally the influence of genetic population structure on the level of biparental inbreeding was discussed. Microsatellite markers were used also to examine the level of inbreeding and allelic richness in the commercial stock of ash seed available for reforestation. Results from both works confirmed that neutral genetic variation in *Fraxinus excelsior* is high and that the level of inbreeding is very low the allelic diversity of an individual seed family may vary depending on flowering synchrony of neighbouring trees. Collection of seed from limited number of trees should be avoided; also the genetic diversity and structure of seed sources should be assessed when obtaining planting material for forest restoration.

Keywords: *Fraxinus excelsior*; delayed fertilization, functional dioecy, gender-related grow difference, gene-flow, inbreeding, non random mating, seed collection, tree-rings, wind-pollination

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