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Intraspecific variation in Yorkshire fog within a limited geographical region.

A thesis presented in partial fulfilment
of the requirements for the degree of
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Abstract.

Topodemes of Yorkshire fog were sampled from within a 50 km radius of Massey University, from ecologically diverse sites, and grown under uniform environmental conditions in order to study the variation in various plant characters between them. In the first of the two experiments undertaken, topodemes were compared as spaced plants in an experimental field. Several characters related to the sexual phase of the life cycle of this perennial grass species (panicle production, seed weight and survival-vigour of plants subsequent to flowering) were not observed to vary between topodemes. For the other such character measured (date of panicle emergence) the differences between topodemes observed were considered to reflect differences in time of pollen release. Thus, where source habitats of differentiated topodemes were in such close proximity that gene flow between them was likely, they were probably effectively isolated.

In the second of the two experiments, topodemes were grown under three water treatments (waterlogged, plentifully watered and periodically dried) in 5-inch pots, one plant per pot, so that differences between topodemes and the effects of the different water treatments on the topodemes could be studied simultaneously. For different vegetative characters studied, topodemes were found to display stable and plastic response to the diverse water treatments, and to be differentiated both in mean response over all, and in pattern of response to, the water treatments. An attempt was made to determine the relationships between the responses of different characters, and between this hierarchy of plant response and environmental variability within and between source habitats. Differential topodeme responses could in some instances be considered to reflect adaptation to the

source environmental conditions. Topodemes T10 and T02, from excessively drained sand dune habitats, possessed more densely hairy leaves, and produced longer laminae under the dry treatment, than topodemes from wetter source habitats. T10 under the dry treatment was able to withstand a greater degree of internal moisture stress than other topodemes before showing signs of wilting. T02 under the dry treatment possessed fewer stomata than topodemes T01 and L02 from marsh and swamp habitats respectively, and in mean response over all water treatments possessed broader laminae than topodemes P02, P04 and L00, also from habitats in which water table level was high throughout the year. P04 and L02 from continuously waterlogged source habitats produced longer laminae under waterlogging than other topodemes, and the latter topodeme, again under waterlogging, possessed a significantly greater mean compressed diameter than other topodemes. However, the evidence for this adaptation did not involve direct experimentation, and therefore the possibility that the genetic divergence demonstrated between topodemes was due to various chance effects, rather than disruptive selection, was not considered irrelevant.

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