THE RELIABILITY OF MIRE WATER CHEMICAL ANALYSIS DATA AS AN INDEX OF PLANT NUTRIENT AVAILABILITY

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SUMMARY

Mire water chemical analysis data are presented to illustrate the fundamental importance of collecting samples from (a) the exact rooting depth of the plant species under investigation, (b) within 10 cm of a specific plant and (c) at a specified time of the year. These three pre-requisites are essential for meaningful comparisons of plant nutrient availability on either an intra or inter-site basis. Large variations in the concentrations of five cations and the specific conductivity of mire water samples, both with time of the year and horizontal distance, were recorded on all four mire sites investigated. These data clearly demonstrate that mire water sample collections which do not comply with the pre-requisites above are of limited value for comparative purposes, and may not even be relevant to the species or plant community under investigation.

INTRODUCTION

It has been suggested that mire ecosystems offer the best units for the study of natural vegetation in relation to mineral nutrient supply and, therefore, could represent a basis for comparison of the productivity of other vegetation types. Both the chemical constituents and specific conductivity of mire water are relatively easy to determine using modern methods and samples are easily collected in many situations. Therefore, chemical analysis data of mire water are frequently presented to indicate plant nutrient availability and/or for comparative purposes between different mire communities.

Recent investigations have clearly demonstrated that mire water chemistry may vary considerably over very limited horizontal and
vertical distances, and with the time of the year. Although the main rooting zones of many mire inhabiting plant species have been reported, samples of mire water are, apparently, frequently collected at unrealistic depths, or some way from the vegetation under investigation or at an unspecified time of the year.

A sampling probe has been described which enables the depth from which mire water samples are taken to be controlled accurately. The data presented below show, also, that in order to provide meaningful information on mire ecology, water samples must be collected within 10 cm of a single plant of the particular species under investigation, or be replicated several times within a pure stand or localised community, in order to account for the marked variations in chemistry which are shown to occur. The variations in mineral nutrient concentration which were recorded in mire water on four sites over a period of one year also demonstrate that, in all investigations, the dates of sample collections must be given in order that realistic comparisons may be made with other published data.

METHODS

As part of an investigation relating the growth of *Narthecium ossifragum* to mineral nutrient availability and uptake on four mire sites, replicated mire water samples were collected at regular intervals throughout 1970. The sites were at Roydon Common, Norfolk (62.685225), Wem Moss, Shropshire (33.472342) and the Berwyn Mountains, Denbighshire (33.080307) and have all been described previously. Ten water samples were collected from each site on every sampling occasion (Table 1) by selecting random co-ordinates over a gridded area of size 20 m × 20 m. Samples were taken from the rooting zone of *N. ossifragum* (10–15 cm) and were transported to the laboratory in 150 ml screw-cap, polythene bottles.

To investigate the variations in mire water chemistry with horizontal distance, as opposed to time of the year, a 9 m long transect was laid down at Roydon Common on 2 June 1970. A relatively homogenous plant community was selected for the location of the transect and was a *Sphagnum recurvum* 'lawn' with isolated shoots of *N. ossifragum* and *Drosera rotundifolia*. Mire water samples were collected from a depth of 15 cm (using a sampling probe) and at 10-cm intervals along the transect. The samples were transported as described above.

Each individual water sample was filtered, under suction, through 'Greens 904' filter paper and were always analysed within a day of collection. In every case, the first 5 ml of filtrate were discarded. The samples were analysed, using a Pye-Unicam, SP90, atomic absorption spectrophotometer, for sodium,