SHORT COMMUNICATION

The use of inert polymers in hydroponic studies

Summary

The suitability of polythene granules as a rooting substrate in the water culture of natural and cultivated varieties of plants is discussed and the use of porous, high density polythene tubing for continuous culture aeration is described.

Technique

A culture procedure developed at Nottingham has proved successful for growing a range of plant species. Fundamentally, the technique is one of water culture in which support for the plant is provided by polythene granules ('Alkathene' supplied by I.C.I. Ltd.). These granules are inert and resistant to a spectrum of physical and chemical agents. They have a mean diameter of $3.10 \pm 0.50$ mm, their specific gravity ranges between 0.92 and 0.94 g/cc depending upon the grade used, and the material exhibits high resistance to water absorbing only 0.15% of its weight following immersion for one year at room temperature.

The granules may be used to fill any volume of culture vessel either as a layer on the surface of a nutrient medium, or as a course-grained compact rooting substrate which can be flooded periodically, sub-irrigated, or have a liquid level maintained permanently at or below the surface (Fig. 1). This method has been used as a support mechanism for experimental plants growing in plastics pots (2 to 3 plants per pot) and in polythene containers of 6 litres capacity containing 30 plants.

If required, prior to use the granules can be sterilised at a pressure of 7.04 kg/m$^2$ (10 psi) and a temperature of 110°C. After termination of an experiment the granules may be washed in distilled water, re-autoclaved and prepared for re-use within a few hours.

Another inert polymer has proved successful for the controlled aeration of culture solutions. This device introduces a profusion of minute bubbles with a large surface area to volume ratio into a culture solution by forcing air into a suitable length of 'Vyon' tubing. Vyon, supplied by Porvair Ltd., is manufactured from high density polythene. It has a uniform pore size of approximately 50 $\mu$, is free of detachable fibres, non-fragile, inert and resistant to a range of physical and chemical factors. A selection of flow rates can be
achieved by inserting flow meters between the air supply and the Vyon tubing.

The tubing used was 15 cm long, 1.9 cm internal diameter, 0.2 cm thick and was sealed at one end with a rubber stopper. Small glass plates were employed as weights to prevent the tubing rising from the bottom of the culture vessels. The minute air bubbles percolate freely between the polythene granules and effect uniform aeration of the culture medium.

Experimental method and results

This technique forms the basis of a research programme investigating the growth of plants in culture solutions of varying ionic concentration the results of which will be published later. To illustrate the use of the method the results of an experiment to study the effect of different aeration levels on the dry weight of *Narthecium ossifragum* (L) Huds. are shown in Table 1. This experiment was maintained for 11 weeks with the culture solutions being renewed at weekly intervals.

The levels of dissolved oxygen obtained by connecting 4 manometer flow gauges to lengths of Vyon tubing and one non-aerated treatment, together with pH fluctuations detected after a 5 day exposure period are indicated in Table 2.