FOGGING SYSTEMS FOR PROPAGATION

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Fog has a number of important applications in agriculture and horticulture:

(a) temperature reduction;
(b) humidity control;
(c) frost protection;
(d) application of pesticides.

The plant propagator is primarily concerned with the control of the humidity in the propagation environment. Temperature reduction through the evaporative cooling effect of fog droplets can be a secondary advantage of fog in propagation.

A clear distinction must be made between fog and mist in plant propagation. Intermittent mist is used to provide a film of moisture over the leaves of cuttings and other evaporating surfaces in the propagation house. Fog provides the means to directly increase the relative humidity of the greenhouse atmosphere with little or no free water application to the leaves of the cuttings. The absence of this free water from the leaves of the cuttings provides a number of advantages to the plant propagator:

(a) reduced leaching of nutrients from leaves;
(b) improved aeration of propagation media;
(c) improved management of foliage diseases.

The principal agricultural application of fog to date has been in the cooling of poultry sheds. The primary aim in this situation is temperature reduction. In enclosed buildings with relatively low light transmission significant temperature reduction can be achieved by the introduction of fog into the internal atmosphere.

Fogging for humidity control in the propagation greenhouse presents a different problem due to the high levels of light which are transmitted into greenhouses. As the light level increases in the greenhouse it becomes increasingly difficult to maintain a stable humidity.

Shading of the greenhouse structure is of great importance in evening out humidity fluctuations due to rapid dispersal of the fog. Shading may be achieved by the application of paints or shading compounds to the greenhouse covering material or by the use of external or internal blinds or screens. The potential benefits of fog in the reduction of internal greenhouse temperatures may be substantially reduced in an unshaded greenhouse.

In most propagation situations where fog would be advantageous, such as cutting propagation and in greenhouse establishment of tissue-cultured material, reduction in light transmission to reduce moisture stress is often a standard procedure so propagators should not be concerned at the need for shade to maintain a stable fog.

It must be stressed strongly that fogging systems are not irrigation systems. The fog is being placed in the greenhouse atmosphere to regulate the humidity and it is unlikely that the fogging system will provide sufficient moisture to keep the propagation media uniformly moist. Regular monitoring of moisture levels in the propagation media will be necessary and routine watering may be required.

TYPES OF FOGGING SYSTEMS

The three types of fogging systems commercially available were summarized in a paper presented at the joint New Zealand/Australian Region IPPS Conference in Tauranga in 1987 (1).

(a) Ventilated Fog.
(b) Pressurized Water Fog.
(c) Pressurized Air/Water Fog.

Ventilated fog is not used to any extent in Australia.

Pressurized Water Fog—An installation at the Queensland Agricultural College. An experimental pressurized water fogging system was installed in the Plant Nursery Unit at the Queensland Agricultural College (Q.A.C.) in February of 1988 for evaluation under southeast Queensland conditions.

The unit is installed in a 15 × 6 metre greenhouse and consists of two lines of high pressure PVC pipes mounted at two metres height running the length of the greenhouse. The delivery lines are uniformly offset from the centre of the structure and are fitted with stainless steel micro-nozzles spaced 1 metre apart. The nozzles are inserted into the lines at a 30° inward facing angle. A self-draining valve is fitted to the end of the delivery line to ensure that water does not remain in the delivery line. This prevents possible blockage of nozzles due to mineral accumulation caused by evaporation of water from the nozzle orifice.

Water quality is of great importance with fogging systems and rainwater is used at QAC. A high quality rope-wound filter is used as a pre-treatment to remove solid matter which could cause blockages. Further pre-treatment to remove minerals or salts may be necessary with some suspect water supplies.

A 1.5 h.p. piston pump capable of delivering 8 litres per minute and set to operate at 600 p.s.i. provides the necessary power to generate a fine fog. These small high pressure pumps are very noisy and this may be a limitation to their use in some situations.

Control of the operation of the fog is via a humidistat sensor, although a number of cheaper control systems can be used. The humidistat sensor is located in the crop zone of the greenhouse and constantly senses humidity directly in the zone of the greenhouse where the crop is located. The sensor is connected to a digital control unit which enables programming of minimum and maximum

humidity settings. Once these settings are programmed, the fog will automatically be activated as needed to maintain the required greenhouse humidity.

Shading of the greenhouse structure is provided by the use of white fiberglass on the roof of the structure combined with a white shadecloth lining on the inside of the roof. The level of shade provided means that fluctuations in humidity due to rapid fog dispersal in bright sunshine are minimized.

Experience to date with the high pressure fogging system is that the control of humidity in the greenhouse is much more accurate than was possible with intermittent mist or polythene tents. A series of trials using cuttings of *Chamelaucium axillare* indicate the following results:

Percentage rooting under high pressure fogging system	61%
Percentage rooting under polythene tent and mist	0% (to date)
Percentage rooting under polythene tent only	31%

Cuttings propagated under fog were able to be potted up ten days earlier than those propagated under the tent and, to date, none of the cuttings under mist have rooted.

LITERATURE CITED

1. Gordon, I. 1988. Propagation overseas—an overview. *Proc. Inter. Plant. Prop. Soc.* 37:151–155.