THE HYDROVAC THEORY: WILL IT WORK TO ROOT CUTTINGS?

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INTRODUCTION

About four years ago a South Auckland nurseryman began investigating the use of some kind of controlled environment for the transfer of tissue culture material. This led to attempts to alter the air pressure inside the cabinet. This often resulted in the cabinet blowing up or collapsing inwards. Several cabinets were constructed and discarded, until finally two units, one constructed of steel, the other of aluminum, were considered to be satisfactory. Aluminum was tried because of its light weight. The aluminum cabinet weighed 240 kg compared to the steel unit which weighed 360 kg.

In February 1985 Hortex was approached by the inventor to trial this unit, which he believed would revolutionize propagation methods as we know them today.

Hortex agreed to trial the invention and this paper outlines the machine, its principles and the trials carried out in it.

This cabinet differs from other controlled environmental cabinets in that it is completely sealed, and the pressure inside it can be varied from 0 to minus 14.7 KPA.

DESCRIPTION OF THE HYDROVAC UNIT

The cabinet trialed was the steel unit and it was coated with enamel. It was 2 metres long, 1 metre wide, and 1.9 metres high. It had four shelves which held up to 2500 cuttings in trays. (Figure 1).

The vacuum is controlled by a time clock and is applied by a suction pump with four non-return valves evenly spaced up one side of the cabinet. The vacuum is adjustable between 0 and minus 14.7 KPA.

The cuttings in their trays are flooded by a nutrient solution which is pumped into the support trays by a submersible pump from a 200 litre nutrient tank at the base of the cabinet. The solution drains back to the tank by gravity. This nutrient solution kept the humidity high and there was no need for mist.

Light was provided by two fluorescent tubes above each shelf. These were on a time clock which allowed the day length to be varied as required.

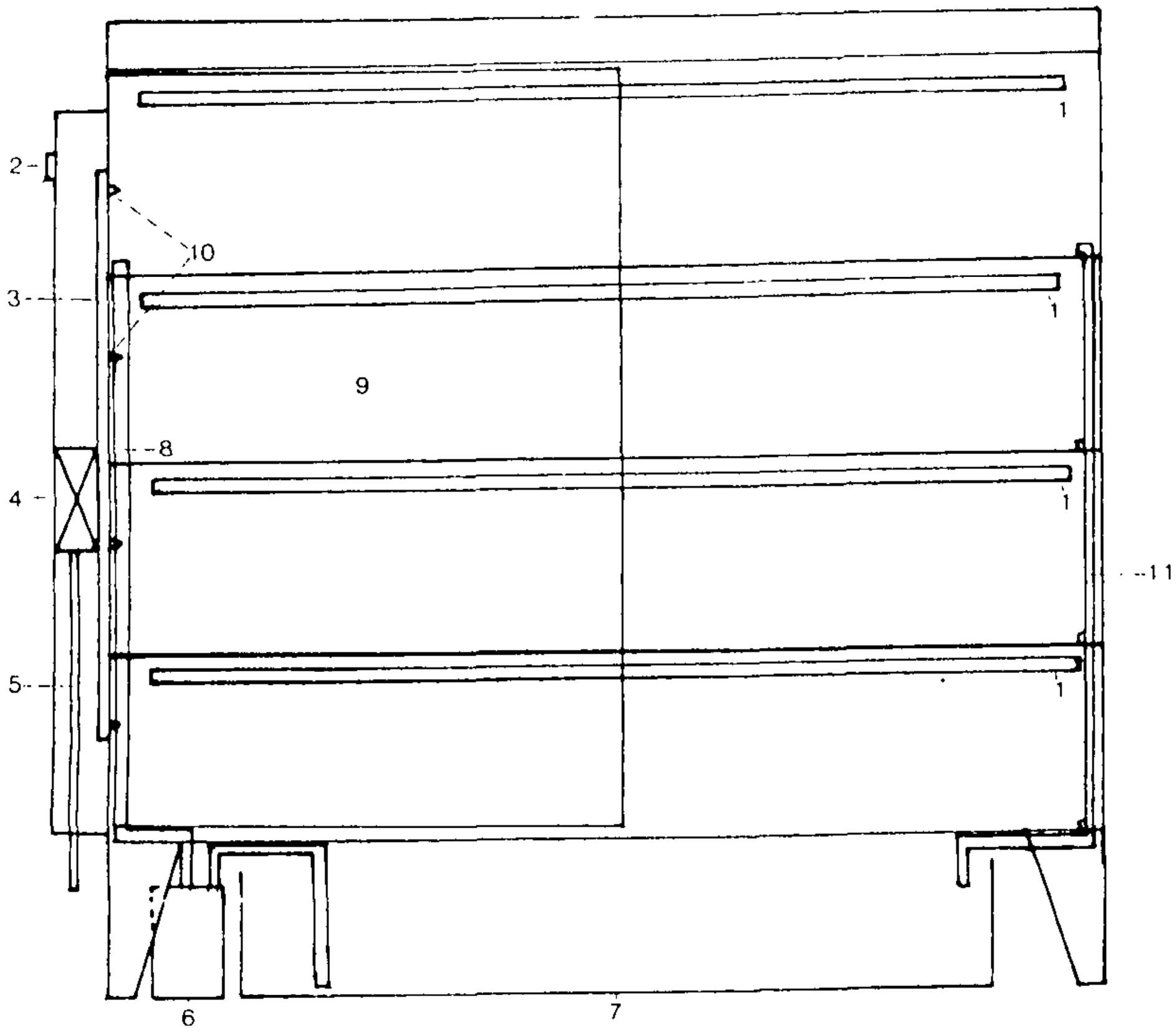

Figure 1. Key:

1 Lights	7 Nutrient tank, 200 ltr capacity
2 Controls	8 Flow pipe
3 Vacuum pipe	9 Door
4 Vacuum pump	10 Non-return valve
5 Exhaust	11 Drain pipe for returning solution
6 Pump	

CUTTING TRIAL

Only one trial has been carried out to date and this was set up on 11 March, 1985, and was run for 21 days; 1600 cuttings were used, and all had a 5 sec. quick-dip in a 3000 ppm IBA solution.

The plant material used was:

500 *Actinidia chinensis* 'Hayward' (kiwifruit)

500 *Feijoa sellowiana* 'Mammoth' (feijoa)

500 *F. sellowiana* 'Triumph' (feijoa)

100 *Daphne odora* 'Rubra'

Half of the cuttings of each cultivar of kiwifruit and feijoa were set into 54 flix propagation trays in a medium consisting of 9 parts pumice and 1 part peat moss. The other half were set in Growool slabs.

The daphne cuttings had been set for four weeks before the trial commenced. They were in trays in 9 parts pumice and 1 part peat moss. Only two trays were placed in the cabinet and these were compared to two trays left in the propagation house.

The cuttings received one nutrient flow every 24 hours at 8:30 a.m. They received a 15-hr. day with the light being on from 5 p.m. till 8 a.m.

The vacuum was on for 75 min., off for 15 min. and then on and off at 15 min. intervals for the next 75 min. This cycle was repeated on a 24 hr. cycle. The door was removed after 3 days and the cuttings inspected. The trial was completed on 1st April after 21 days.

RESULTS

After 21 days the cuttings were not in good condition. The results were not encouraging. All but a few of the feijoas had dropped their leaves as had approximately half the kiwifruit cuttings. The daphne cuttings, however, were in good condition.

Most of the feijoas were decaying at the base. Some had started to swell and form a callus but only one had produced a root. With the kiwifruit the results were better. There was a 41% strike in the pumice and peat media and a 28% strike in the Growool. The cuttings were left in the shadehouse for 7 days before they were tubed.

Of the daphne cuttings, 84% had rooted in the cabinet after 21 days, compared to only 46% of the control in the conventional propagation house.

DISCUSSION

The 41% strike of the kiwifruit cuttings was poor when compared to the 90% usually obtained in conventional propagation houses. These results, however, were obtained in four weeks compared to the usual 10 to 12 weeks.

There was a problem with the shelves buckling under vacuum and causing ponding. When this occurred basal decay of the cuttings was much worse.

It was thought that the light intensity of the fluorescent tubes may have been too high and this may have caused degeneration of the cuttings and led to leaf drop.

Although the feijoas gave a very poor result one cutting rooted in three weeks. For anyone who has propagated feijoas they will realise that this is a very short time. Also the amount of swelling on the base of the feijoa cuttings indicates that the

healing process of the wound may have started immediately. The end result may have been quite different if decay had not set in.

CONCLUSIONS

The hydrovac being only a prototype needs many modifications before the vacuum theory can be proved one way or the other.

A dimmer switch may be needed to reduce light levels, which possibly would reduce leaf drop.

The shelves need to be reinforced to prevent buckling under vacuum which caused ponding of the nutrient solution and led to root decay.

A glass panel is required in the door so the cuttings can be observed at any time.

The door needs to be modified, as it is attached by 6 wingnuts making it awkward to replace and obtain an effective seal. This may be achieved by something similar to a coolroom door for ease of operation.

The limited results from the first trial are not a fair indication of whether the vacuum does encourage root initiation or not. What is clear is that roots were produced much quicker in the hydrovac, than in conventional propagation houses. There is sufficient encouragement from these preliminary results to continue testing the vacuum theory.

PROPAGATION OF *PIERIS JAPONICA*

ED AND GWEN ARTLETT

Taihoa Nursery
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We have a small, cold climate nursery about 820 metres above sea level. We have developed a method of producing a reliable crop of *Pieris japonica* which has proved to be very successful.

It is essential to have healthy stock plants, as the percentage strike falls if the stock plants are neglected. Cuttings are taken in late summer or early fall (February and March and even in April), but the percentage strike falls if the outside temperature drops below 20°C.

Tip cuttings are collected in the early morning. Cuttings of a uniform length are taken for each cultivar (an abundance of stock material is required to do this). The cuttings are treated