

THE FRENCH WAY TO PROPAGATE PLANTS

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This paper will be confined to a discussion of cutting propagation at the Andre Briant S.A. Nursery in France.

MOTHER STOCK

The cuttings originate from three different sources, namely:

- Field-planted mother stock cultivated uniquely for this purpose.
- Mother plants grown in tunnels, which permits the forcing of plants, to produce cuttings which are more tender in a shorter time.
- Finally, young plants themselves grown in our small pots.

Which are the best cuttings? In a lot of cases the cuttings are better and root more quickly when they are produced in the tunnels or from young plants, as the younger material gives better rooting.

This is true, for example, for all cultivars of: *Malus*, *Betula pendula*, *Prunus serrulata*, Molle hybrid azaleas, and many others.

On the other hand, this young material is very sensitive to excesses of heat and humidity. This is particularly true for certain plants such as *Hypericum calycinum*, for instance.

Also, once very herbaceous cuttings are rooted they are no longer supported in an atmosphere which is entirely "suffocating". Therefore it is necessary to be able to aerate them at this precise moment. It is then desirable or even imperative to have only one type of cutting in the same tunnel.

In total, the percentage of cuttings, in relation to their origin, is the following: 70% from field-planted mother stock, 10% from outside sources or different gardens, 10% from young plants, 5% from tunnel-grown mother stock.

The material for cuttings is often brought in from a few kilometers away, to the place where they are made. In general, the wood is cut in the morning, then kept in the coldstore for a maximum of two days for herbaceous material, or a few days to a week for evergreen material.

Conifers can be stored for a greater time without damage at 0°C and 90% humidity (for two or three weeks). In storage, all the cuttings are covered with plastic sheeting.

HOW THE CUTTINGS ARE MADE

Without exception the cuttings are all made with the aid of secateurs. The speed of operation varies according to the ability of the worker, and also with the plant species.

The average speed of preparation is about 450 cuttings per hour, but varies a lot, for example: 180 cuttings per hour for *Berberis* vs. 700 cuttings per hour for *Cotoneaster dameri* 'Skogholmen'.

The quality of the cuttings depends a lot more on the choice of the branch, which must not be too thin or too thick, than on the quality of the cut.

A good worker is expected to have not only good dexterity, but also good judgement. He must be able to choose quickly from the pile of material before him the best branches from which to take the cuttings. This must be done without wasting time. On the other hand, if it is a question of juvenile material, the choice of branch is a lot less important, and the only concern is the speed of the execution.

The operators charged with making cuttings are placed in front of a little table, one behind the other. On their right, a long table joins all the small individual tables. On each long table is found the material for cuttings; the finished cuttings are placed in little piles on the left of the worker. It is absolutely crucial that the waste falls gradually to the floor, so that good vision can be maintained for the work being done, and so as to have cutting material only in front of the worker.

One person is assigned to apply the hormones to the cuttings. This person passes before each operator with a trolley on which are found the storage boxes, the hormones, the fungicides, and the labels. The piles of cuttings are gathered together, dipped in the hormones and regrouped in rows in the boxes in a way that allows the planters to pick them up easily. As a general rule, a label is attached to each box. The person in charge of this controls the coordination of the procedures and estimates the quantities.

The hormones used are the following: Rhizopen AA (0.5%—1%—2%), pure liquid Exuberone, and Exuberone powder H.

We mix a fungicide with the hormone according to the situation and the different percentages. As far as we are concerned, the choice of hormone does not depend on the species or the cultivar, but on the vegetative state of the cutting (with rare exceptions).

INSERTION OF CUTTINGS

After the application of hormones, the cuttings are held in the coldstore, the boxes being stacked and arranged according to species and cultivars—one row equals one cultivar—in a plastic cupboard with partitions which allows storage at the necessary humidity for good conservation. They are planted the next day.

The cuttings are inserted either in cellular trays or directly in frames. In both cases, the planting is done in the tunnel. The making of the cutting and the planting are therefore two well separated operations carried out in different places.

The use of cellular trays offers two principal advantages: Firstly, it facilitates the selling of the rooted cuttings. The cuttings are therefore of better quality for selling directly than bare-rooted cuttings. They are easier to transport and store. Secondly, it facilitates the use of potting machines for further planting into pots or containers.

Propagation in multipot trays allows repotting at a less imperative date than if we used bare-root cuttings. Thus, we are less concerned about a possible delay in the originally planned repotting programme. The cuttings from cellular trays start to produce new roots almost immediately after repotting. This type of propagation gives an important saving in hand labour and volume of substrate.

Equally, there is a saving in labour in the transference of cuttings from the propagation sector to the repotting site. The multipot trays allow us to have better control over phytosanitary problems, as there is less contact among cuttings themselves and an easier isolation of sickly cuttings.

It is necessary to know, however, that the propagation in trays is not the same as the propagation in frames. The behavior of cuttings is very different. The needs in humidity, for example, are totally different. It is a question of adapting oneself to the new demands of our cuttings. Having disturbed them in their habits it is necessary for us to catch up and quickly meet their new requirements.

The cost of production is very similar for a cutting in a cellular tray or one in the frame. But we still use the frame planting technique for the cuttings which, subsequently, have to be planted in the open field. On the other hand, it is necessary to note that the cuttings in the cellular trays are much more sensitive to winter cold and that they, therefore, demand important protection and sometimes the use of an antifreeze heater.

GREENHOUSES AND TUNNELS

We only use double-skinned polythene tunnels with lateral windows for aeration. These tunnels are eight metres in width and thirty metres in length. It is possible to plant up to 110,000 cuttings per tunnel.

The substrate used consists of 50% fine Irish peat and 50% sand from the Loire Valley. The same substrate is used in the frames as in the cellular trays. After mixing and preparation, the medium is sterilized with methyl bromide. In the frames, the medium is changed every two or three years.

The cellular trays are filled with substrate near the tunnels with the aid of a special machine built for this purpose. They are then transported on pallets to the tunnels where they are unloaded onto a flat black plastic canvas. At the time of planting, a board is placed

across the trays, and the planters stick the cuttings kneeling on this board.

All the tunnels are white-washed with a chalk-based paint to avoid scorching in hot weather.

IRRIGATION

Two types of irrigation are used:

Mist System. This actually is a fine watering controlled by a central clock through an electromagnetic valve and programmed in advance. The watering lasts for about 10 sec. It comes on once a day in cloudy weather, and eight times a day maximum in very hot weather. Between these two extremes, all other variations are possible.

We can also water manually if, at a precise moment during the day, the necessity arises for one or two tunnels only. This system has been used for ten years, and has been entirely satisfactory for most species and cultivars of shrubs and conifers. It has proved to be a very economical system.

Fog System. The fog system is a new technique which we have been using for four years. The fineness of the fog is obtained by mixing air under pressure with water. This allows a high hygrometrical degree to be maintained in the greenhouse without using too much water. It is a technique which is perfectly suitable for herbaceous cuttings in June, July, and August. The trials that we have done on conifers have proved equally successful. However, given the increased cost, we use it only for the first three weeks of rooting herbaceous cuttings. After that the conventional mist system is used.

Maintaining humidity at almost saturation without any dripping water on cuttings is the main advantage of the fog system. Considering the fact that many species respond to an ambient humidity of 100%, but do not tolerate water on their leaves, this technique seems ideal. The results tend in effect to prove it.

It should equally be observed that fog permits us to work at high temperatures without burning, as it gives a certain amount of shading. To be exact, however, it is better to add to the fog one or two waterings for a maximum of about 10 seconds.

ADDITIONAL COMMENTS

Supplementary heating is very seldom used. We try to use solar energy as much as possible. However, in the future we are thinking of using surface heating, especially for the propagation done at the end of autumn, in winter, and at the beginning of spring. This supply of bottom heating is not, in general, essential to rooting, but it speeds the operation, particularly for evergreen species.

Gradual weaning of the cuttings is very important. Exposure to

the open air is one of the tricky points. It has to be done very gradually, neither too late nor too soon.

The speed of rooting is variable, it may be a few days for *Buddleia*, *Perovskia*, *Lespedeza*, and miniature rose-trees, to a few months for × *Cupressocyparis leylandii*, *Taxus*, and *Picea* (in the colder months).

The success depends equally on the year and the species and, of course, it is linked to the weather conditions at the moment.

Our average success rate last summer was about 80%, on more than six million cuttings, but we lost 5% over the winter.

Our programme of cuttings production is as follows starting with the month of May:

May:	Take cuttings of conifers such as <i>Thuja</i> and × <i>Cupressocyparis</i> .
June, July:	Take herbaceous cuttings of deciduous species
August:	End of herbaceous cuttings—beginning of cuttings of evergreen species.
September	
Oct.–Nov.:	Root cuttings, without bottom heating, of evergreen species of trees, including conifers, and shrubs.
December	
Jan.–Feb.:	Root cuttings of conifers and other evergreen species using bottom heat.
March	_____
April	

I have not mentioned the acclimatization of the *in-vitro* cultures as this technique is being constantly refined.

The *in-vitro* cuttings are delivered in wide-mouthed bottles. At the moment about 20% of them are rooted—for example: *Rhododendron*, *Cortaderia*, and so on. We plant them out into cellular trays like the conventional cuttings, and place them under a 50 micron plastic film. A single watering has to take place whilst waiting for rooting. This is done at the time of planting out. The plastic film is lifted a few hours a week to change the air. Up until now, we have been satisfied with the method of weaning *in-vitro* propagules. But, it is necessary to be on guard against diseases which spread very quickly on these especially fragile cuttings.