

## SUCCESSFUL ESTABLISHMENT OF ROOTED CUTTINGS AND SEEDLINGS IN THE FIELD

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This subject takes in a large territory as there are so many different varieties and types of cuttings and seedlings. There are also different ways of accomplishing this and I am going to tell you only about the groups I am acquainted with and the way I try to handle them in my own nursery

When I first saw this heading, I had a very easy answer. In order to get the best results in planting and transplanting you just plant everything early and on time. It is as simple as that.

But I don't think you people are satisfied with such a simple answer as that. No doubt you have the same problems as I have, that is, you simply can't plant everything early and on time. Now we try to do the next best thing and that is to see how to get around this in order to get a satisfactory stand when we are planting later than we should.

To start with, we have one very good method and that is potting up all your cuttings and seedlings or putting them in bands. To my mind that is an excellent method to insure good stands, especially where a good many people take this small stock and line it out in field rows over the field. But all nurserymen do not operate their nurseries in the way.

We are all nurserymen and most all of us have nurseries, or responsibilities to operate a nursery. We use almost as many methods as there are nurseries. Yet we are all after the same results, which is to get good stands and try to make a profit on our operations.

Now to come back to potted and banded stock. As I said before this is an excellent way to insure good stands and would recommend this for retailers who do a small amount of propagating.

However, for wholesale growers who often propagate in large quantities, it seems to me it is quite expensive to pot up or band cuttings and seedlings.

Personally I prefer to bed out all my cuttings and seedlings for one or two years to build them up before lining-out, especially where we have irrigation and shade over the beds, which gives very good control over the rooted cuttings and seedlings and gets them established very successfully.

Speaking of irrigation I would like to say a few words about it. Some years ago when we were forced to use irrigation, which was new to us at that time, we learned that there was more to it than just throwing water on the beds. The summer we started it was hot and dry and we laid out a small irrigation system. A number of cuttings and seedlings were dying in the beds even under shades. After we laid out the system, we turned on the water and let it run for 8 hours and then moved the sprinklers. While moving the sprinklers we would sink ankle deep or more in mud and thought we were all set.

But what a disappointment! Three or four days later you came back to these places and found the ground was hard and dry again, as if it had never been irrigated.

As far as I was concerned, it did not do much good and we had to find a better way of irrigating. The following spring every time we planted six or seven beds we would irrigate them. I decided that if we irrigated while the soil was still loose and open, the water would go down much deeper and last much longer. That is just how it worked out.

After these rooted cuttings and seedlings have been bedded for one or two years, they have a strong root system of fibrous roots, which will help to eliminate losses after lining them out over the field.

We also take hardwood shrub cuttings and root grafts and plant them very close together in narrow rows for one year so that when we line them out the following year, we will also have heavier stock by the time they are dug.

As you have noticed up to now, I have been talking about the preparation of the liners, which I think is very important. To me a good liner with a good root system is more than half the battle in order to get a good stand after planting. A strong liner will also produce a stronger and better plant.

To me it is always very poor economy to try to save a few pennies on a liner. A poor liner or a light liner will give poorer results in stands and a poorer block of stock. You are not only apt to have more losses after planting but will also end up with every so many more culls. Personally I always try to buy the best liners or seedlings as they are the cheapest in the end and will give you best results after planting.

Now we come to lining out these transplants over the field and I'd like to say just a few words about the land these liners are to be planted on

I think it is very important to have as much humus as possible in your soil either by using manure or cover crops, or better yet by using both, and have the ground well worked over and plowed quite deep.

I like to plow 12 inches or more. When you plow deep, you will find that your soil will retain more moisture when you run into dry weather as deep, loose soil will sweat better. Humus will also help to retain moisture. A deep plowed soil and humus makes a happy combination and will help to insure better stands and better growth.

Now if you are so fortunate that you can start lining out as soon as the weather opens up in the spring, you don't have much to worry about your stands as that is the proper time to start planting. We are not so fortunate as we have to get our orders out first and then start planting. Naturally, we try to get some items planted early between digging orders but the amount of that depends a good deal on the weather. If the spring breaks late, we are out of luck. If it breaks early and we get 2 or 3 rainy days a week so we cannot make any headway with our orders, we are out of luck. You see we are always battling with the weather.

I mentioned before, so long as we can't plant early we try to do the next best thing and see how we can get around this.



What we try to do is to dig and heel in as many liners as we can.

Take for instance shrubs from hardwood cuttings or root grafts. We dig them and trim the roots but not the tops. By trimming the roots when you heel them in, you will not have to cut them back again when you come to plant them. By the time you come to plant them, they will have made a lot of new roots and all of new roots are saved when planting.

Now the reason we don't cut the tops back at the time we heel in these liners is that when these shrubs start to grow, the branches will start to leaf out all over, but the eyes at the base will remain dormant longer. When we plant these shrubs, we cut back the branches and do not have to contend with all the soft growth, which wilt badly and make the plant suffer considerably. In this way you have a plant that does not suffer much when it is lined out and by leaving all the young roots intact they reestablish themselves within a few days. We apply the same method to shrub seedlings.

On the other hand if you have rooted softwood cuttings, which were rooted the previous summer in frames, you can line them out very successfully even if they are leaved out, due to the fact that they have much softer and finer roots and do not get such a shock when you dig them. They reestablish themselves very quickly.

Of course there are a great many different varieties of shrubs and woody plants and they do not all respond to the same treatment therefore there will always be exceptions.

For instance, I would like to mention just one item, *Vibrunum* from softwood cuttings. I prefer to line these out after they are leaved out as they seem to pick up quicker and grow better. I have seen *Vibrunum* softwood cuttings planted dormant, which gave a poor stand.

I would also like to mention *Cotoneaster*. Some varieties are rather troublesome to transplant. This can be easily overcome by transplanting them every year or root pruning them every year. They should be handled in the late fall or early spring as they make new roots in cold weather. I also prefer a seedling to rooted cuttings as they have a better root system.

**EVERGREENS** . With the evergreens, when we heel them in, we cut the roots and the top back as they don't break out as lush as shrubs do and will hold back for quite a while but they will be making new roots while they are waiting to be planted. Here again the new roots will help to insure a good stand.

**BROADLEAFS** . We do not worry too much about the transplanted broadleaves, such as azaleas, rhododendrons, andromedas, etc. as they have a very fine root system and respond very easily. If they get too far ahead of us before we can get to planting them, we shear off all the young growth before digging them.

Of course there are also rather troublesome broadleaves, such as large leaf holly, for instance, *Ilex opaca*, when it comes to transplanting. They seem to dry up easily. In order to overcome that, we have gone through the trouble sometimes to cut off all the leaves. We would wait until the eyes in the axil of the leaf would swell and turn red, which

signifies that the sap is running. By doing it that way we have transplanted holly very successfully.

You may wonder why I have not stressed irrigation more than I did. The reason for that is that very few of us have irrigation all over the nursery as it takes a tremendous amount of water which most of us are lacking. For those that are fortunate enough to have irrigation all over the nursery, it means added insurance to obtain good planting stands.

Today we also have temperature controlled storage cellars or sheds, which are very valuable to the nursery business. This is an ideal place to keep your liners perfectly dormant until you get around to planting them. This way the plant does not spend any of its energy before planting and is a great help to late planting. There is only one drawback to this and that is it is so expensive to build that most of us do not have them.

I have omitted fruit stock and shade trees as I have not had any experience with them as I only grow ornamental stock.

What I have tried to bring out is that your soil structure, irrigation and the preparation of your liners all play a vital part in the successful establishment of your planting.

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PRESIDENT SCANLON: Thank you, Case, I am sure that there will be a number of questions or comments on this subject.

MR. HICKS (The Cottage Gardens, Lansing, Michigan): Do you think it is better to trim the roots of junipers and try to get new growth in the spring or would you plant them earlier in the spring if you could or would you prefer to have new roots?

MR. HOOGENDOORN: Sure, you can trim them and plant them.

MR. HICKS: You prefer to trim the tops of the evergreens first before you plant?

MR. HOOGENDOORN: That is right.

MR. HICKS: I had heard some preferred to plant the junipers and then trim the tops after a couple of months, getting better growth that way

MR. HOOGENDOORN: That is just it; everybody has his own opinion.

MR. C. S. INGELS (The Home Nursery, Lafayette, Ind.): I did not hear you say you used any Wiltpruf in transplanting your evergreens.

MR. HOOGENDOORN: No, we have never used it.

MR. INGELS: I would like to ask if anyone has used it on cuttings and do they find it shocks them just a little? Does it take the cutting a few days longer to take off after you use Wiltpruf than if you didn't use it?

MR. HUGH STEAVENSON (Forest Keeling Nursery, Elsberry, Mo): I have had very little experience with Wiltpruf, but I sort of



proceeded with the idea Wiltpruf and other anti-desiccants were a lot of hog wash. There are reports of a group of experiments in this country, Canada, and Australia where an attempt was made to extend the planting season of conifer field planting stock, by using antidesiccants such as Wiltpruf. In no case in those three countries was there any benefit from the use of antidesiccants in late planting.

I wonder if there is anybody here who has good control tests using Wiltpruf or not using it, or any other antidesiccants where the control was such that they knew really whether they were getting any results.

MR. ZORG. As I told the previous speaker, we use Wiltpruf on our cuttings before we put them out in the field. In our nursery we have 100,000 cuttings, handled in the shade house for a whole year. Before we take them out we Wiltpruf them. We spray it on with a hand pump, with a little hand sprayer, and the recommendation is that you use one gallon of that substance in eight gallons of water. We use it just double, so we use one gallon for four gallons of water, and we found that it really helps the cuttings to establish themselves quicker, because it gives a thin film on top of the leaves. We use this on evergreens and it keeps them for a while until the cutting really makes a few new roots. We really found it was an asset. We have planted plenty of cuttings without Wiltpruf.

MR. STEAVENSON: Do you also use it on your fall planting lining out?

MR. ZORG: With the fall planting, you wouldn't have much difference, because with the fall planting you wouldn't lose much because you don't get the hot weather, but with the spring planting and, especially when you plant in June, in Tennessee, when it is really hot weather, you lose plants where you don't use it.

MR. FISHER: When they go out in the field after they have been treated with Wiltpruf, are they planted with a transplanter and watered in or do you have irrigation that you use afterward?

MR. ZORG: We plant them out with a planter, the mechanical planter, and after they are planted we do not irrigate them at all. We just leave them in the field. Of course, when we get rain, so much the better. When we don't get rain we just don't bother reaching that special field with an irrigation system. Our nursery is quite extensive and you can't always reach everything with water. Of course, we have a lot of irrigation system, which we use for transplanting, when it is necessary, but we have parts we can't reach.

MR. JOHN B. HILL (Hill Nurserv, Dundee, Illinois): I think I can give a small report on the use of Wiltpruf. In the summer of 1955, owing to a delay in getting going in the spring, we found it necessary to plant established cuttings out of the plant beds in the field. We took the time and trouble there to set up a control experiment whereby we applied Wiltpruf at the recommended 1 to 4 rate. If we waited 48 hours after applying Wiltpruf before we lifted the plant, without disturbing it, and planted it out, there was an appreciably better stand on the plants that had been treated against those that hadn't been.

What experience have you had going directly from the rooting bench to field rows?

MR. HOOGENDOORN: We don't do that at all.

MR. LEROY HETZ (Fairview Evergreen Nurseries, Fairview, Pa.): We line out about 800,000 cuttings out of the greenhouse right out in the sun with the mechanical planter. It is Hawlins cylinder planter. We don't shade them but we cultivate them immediately and if the weather becomes too dry, we use portable irrigation. The cuttings are lined out in rows which we cultivate with an Allis Chalmers G tractor, three rows at a time. Then we leave them either two or three years and they become quite large in three years and we have a U digger on this Allis-Chalmers. There are three of the U-diggers really, and we dig three rows at a time.

I would like also to state we planted about 40,000 upright *Taxus* this fall and we used Wiltpruf on them. We had a very dry fall and they didn't die. They are good. They didn't grow any tops but they did grow good root systems.

MR. HOOGENDOORN: In other words you take your cuttings from the greenhouse bench and line out into field rows. Ours would all die.

MR. HETZ. Not with Wiltpruf.

MR. THOMAS S. PINNEY (Evergreen Nursery Co., Sturgeon Bay, Wisconsin): We do the same thing as the former speaker mentioned. We will plant directly from the greenhouse bench. We can't even get out until the first of July to do the transplanting. We shade them and irrigate them heavily. We have very small losses and we figure the actual cost of banding is not worth it in our operation. We do prune them at the time we plant them out. On succulent things we will use Wiltpruf. This is hand planting. We will plant directly out with a machine, *Euonymus*, Alpine currant, and other things of that nature and we will use Wiltpruf on them.

MR. HOOGENDOORN: Can you plant *Taxus* cuttings from the sand bed right out to the field without any shading?

MR. PINNEY: No, we haven't tried them as yet. They are shaded. Most of the evergreens go out in beds planted by hand and shaded or planted by machine and shaded at least for two weeks afterward.

MR. J. S. WELLS (James S. Wells Nursery, Inc., Red Bank, N.J.): Soon after I came to this country I happened to take my father to Mr. Hetz's nursery and was amazed at what he was doing. I can vouch for his system. It works with him, and it works for a number of other people. Vincent Bailey up in Minnesota does it, but he happens to be living a few miles from a large stockyard and can get unlimited supplies of manure and treats his land in an astonishing manner. He ends up with a soil condition which is just perfect. With that soil condition I think you can go direct from the bench. We tried it at Koster's Nursery and it worked fairly well for a few years, I thought, until we began to keep accurate records and, consequently, found out how many of the plants were not growing. I am convinced that if an accurate tally is



maintained of the number of plants planted, and of those that finally get through, you will find that the extra work is not necessarily a liability.

MR. WILLIAM FLEMER, III (Princeton Nurseries, Princeton, N.J.): Do you think there is any value in puddling — that is dipping the roots in a mud solution as they used to do in the old-time nursery, or do you think it mats the roots together and doesn't improve the stand?

MR. HOOGENDOORN: Years ago we used to dip in thin mud, but then we found when you get dry weather and the soil is dry, you pull the plant up, the mud will cake to the roots, and naturally, it is going to be that much harder for the young roots to break through. We have eliminated puddling and we just dip in clear water and plant.

MR. LESLIE HANCOCK (Woodland Nursery, Cooksville, Ontario): Will you give us your opinion about hilling up immediately after planting in the fall?

MR. HOOGENDOORN. You can do that very well with young shrubs. You can hill them and take the hill away again in the spring. But when planting evergreens, you would be spoiling all the bases of the evergreens. I don't think it would work out well. Furthermore, if you have real wet land, I don't think you should hill.

MR. ZOPHAR P WARNER (Warner Nursery, Willoughby, O.): To get back to this Wiltpruf problem, I would like to suggest that maybe we are trying to put all the plants into one category, and I don't think we can. On the things like *Taxus* or spruce or those things that do not make any top growth after they go out, then it might be very beneficial. With some of the broad leaf evergreens, such as *Pieris*, *Rhododendron*, and magnolias, where the top growth precedes the root growth, it is absolutely detrimental. You sometimes will get defoliation of the older leaves that you badly need to support the new root growth.

The question I would like to ask is: What has anyone done with starter solutions, like liquid fertilizers or whatever you want to call them, to cut down this lapse until the new roots start?

MR. LOUIS VANDERBROOK (Vanderbrook Nurseries, Manchester, Conn): I might pass out the thing we have done in the past few years. For everything that we plant out, we take out a 55-gallon barrel of water to the field, and we take a pailful of soil and throw it into that 55 gallon of water and we add seven pounds of Ra-Pid-Gro to it, stir thoroughly and dip every plant we plant in there as it goes out to the planting crew. We find that there is a lot quicker starting and a lot better results.

To get back to the Wiltpruf problem, we have conducted what these fellows call control tests with the originator of Wiltpruf, Dr. Baumgardner. We definitely had detrimental effects and complete scorching of leaves on *Magnolia soulangeana*, *M. stellata*, and *M. stellata rosea*. I had put on the Wiltpruf and potted the magnolias in the greenhouse before we planted them out in the field. They would be planted out anywhere from 12 to 48 hours. Those Magnolia leaves had considerable scorch on them and they dropped. I did have Dr. Baum-

gardner come out and he said, "We will have to change our formula." We were using a dosage of one to ten and not one to four, and we got scorch. We have come to the conclusion, that on tender succulent growth, Wiltpruf can be detrimental on our hardwood cuttings in the greenhouse. On our propagation, before they went out in the field we sprayed those right on the bench with Wiltpruf, perhaps 36 to 48 hours before they were planted out. Plants like *Philadelphus virginalis* and *Hydrangea* suffered terrific scorch. I did the same things on pyramid arborvitae and Plitzer's juniper and those evergreens were planted out in the field. This was a control test. They were scorched terrifically with Wiltpruf and they have been there two years and still show the effects of the Wiltpruf.

What I am trying to convey is that Wiltpruf has its proper use under proper conditions. It is a good thing to use in transplanting retail material, to prevent desiccation, but on the tender stock right from the bench to the field, we cannot make it work.

MR. HOOGENDOORN: You meant to bring out, Louis, you scorched all these by using it 1 to 10?

MR. VANDERBROOK: That is right. My conclusion is if the foliage is too tender and Wiltpruf is put on, it has the effect of almost a burning. It scorches right through the leaf sometimes. Some fellows may bring up the point if you use it as a misted spray and break up the spray into very fine molecules you might not get the scorch. We have used different types of nozzles. We have put it on as a coarse spray and we have put it on as a fog. Some minutes particles, almost pinpoints, maybe an eighth to quarter inch fall, and we get the same results, whether pinpoint or coarser, of scorching throughout the tender foliage. It might work in other localities but not where we are in New England. I might make one other comment. Before we used Wiltpruf we were using Dow Wax. When we were using Dow Wax we never get any scorch.

MR. HOOGENDOORN: You would think the wax would scorch more because it draws more heat.

MR. A. M. SHAMMARELLO (A. M. Shammarello & Son Nursery, Cleveland, Ohio): I have had a very unpleasant experience with Wiltpruf. It may bring out a lot of arguments. I can only tell you what happened to me. In any case, we plant in July. We can't get to our planting until then. We transplanted several thousand rhododendron and azaleas, mountain laurels, spiraeas and *Ilex opaca*. When I read about Wiltpruf I thought that was the answer to all my problems. So we went ahead and sprayed perhaps a couple of days ahead of time we were to move our plants. Now the plant material we were to move was two or three years old. It was not soft as Mr. Vanderbrook's plant material. We had over a 50% stand. So we don't Wiltpruf anything any more.

MR. TADPOLE (Beaver Hall Farm): My experience is just a little bit different. In our greenhouse operation we don't sell any rooted cuttings. They are all transplanted into a prepared soil flat and we deliver none of these transplants until the latter part of July.



In other words, they have all had new growth but it is hardened off. The flats are under the trees outside for about a month or six weeks. This includes *Taxus*, arbor vitae, juniper, rhododendron, azaleas, American holly, English holly, and a few other things. They are all treated with Wiltpruf before they are taken out of the flats and shipped in packages. I have yet to find a customer who kicked, so it must be all right.

MR. SHAMMARELLO. It seems to me that when we had a shower or even a dew in the morning, that dew would just roll off the foliage of the treated rhododendron and azaleas. I believe, that caused those plants to dry.

MR. WARNER. I would like to hear one of the professors here carry this thing a little further in regard to what physically happens to the plant when you put Wiltpruf on it. Doesn't that slow down the transpiration? If you put it out in the sun under a forced draft and slow it down, would you have a little different effect than if you used it in the shade?

MR. AART VUYK (Musser Forest, Inc., Indiana, Pa.): We used the material for spring planting only once, and I think it definitely set the plants back. It burned about 75 percent of the leaves.

MR. HOOGENDOORN: It would seem that it doesn't work very well on soft foliage.

PRESIDENT SCANLON. Perhaps it would be wise to discontinue this discussion at this point. If there are further questions, they can be included in the Question Box Session tonight. Thanks again, Case for the discussion.

MR. WELLS. We have a guest here whom I think can describe a type of propagation frame, the Nearing Frame, better than anyone else. I ask permission for David Leach, of Brookville, Penna. to describe the Nearing Frame.

PRESIDENT SCANLON: I am sure we will want to hear from Mr. Leach.

MR. DAVID LEACH: My experience with the Nearing Propagation Frame began about eight years ago when a nurseryman from New Jersey told me of the inconsistent results he was having with it. He asked me if I would undertake a series of experiments with hormones to try to find some method which would be effective for this particular type of propagation and I did. More chance than anything, I got started on an 18-hour soak in aqueous solutions. It finally developed that 75 parts per million of indolebutyric acid aqueous soak for 18 hours gave results at least as good and probably a little better than any I had heard about in any other method.

Over a period of about eight years the poorest results we ever had were 92 per cent on about 800 cuttings, anywhere from 50 to 70 varieties, a large part of which were the hard-to-propagate red sorts.

Now the Nearing propagating frame is essentially a cold frame, which sets on top of ground. It has a bottom in it and has a sloping back. The length of the back is calculated according to the angle of

the declination of the sun, so that when the sun is in the northern limits of its travel, on June 21, it doesn't enter the frame. It must be oriented due north.

Now, after experimenting with this device for about eight years, there are aspects of it I don't understand and I think there is a little bit of witchcraft going along with it, but it has worked out very successfully.

I have found you have to have a minimum of 350 foot candles of light for the frame to operate successfully.

Another thing about the propagation which come from it, there is a very low post-rooting mortality, anywhere from six-tenths of one per cent to one per cent, whereas rhododendron propagated in a greenhouse with heat, at the end of one year the average mortality is about 15 per cent.

The method is slow but it is cheap. The cuttings are stuck in the middle of September and taken out the following August. However, they usually put out one growth in the frame. There is no expense of greenhouse space involved. The cuttings are watered once a week until they freeze in the fall, and there is no attention of any sort required until the following spring when they are watered once again.

These cuttings aren't ventilated, which is contrary to one of the speakers we heard this morning, who said he found the condensation overnight in a cold frame to be injurious. That is not the case at all with rhododendrons. There is no ventilation until the cuttings are taken out of the frame in August. At that time they have such root masses that you can't get them into four-inch pots.

With such hard-to-root varieties as Dresselhaus, Charles Dickens and Mrs. C. S. Sargent, I find the Nearing Propagation Frame is a successful device. It is a successful device in a commercial sense. I only have one of them and it has a capacity of 600 cuttings but I feel it is a representative pilot system that can be expanded indefinitely. Warren Balwick in New Jersey propagates many, many thousands of rhododendron each year with this method.

That is a brief description of the frame and how it works. If there are any questions you would like to ask me about it, I will try to answer them.

MR. RALPH M. FISHER (D. Hill Nursery Co., Dundee, Ill.): What is the foot candle reading when they are taken out? Do you shade them or what is the light intensity after the shift?

MR. LEACH: They are taken out in August and put in ground beds in a pine woodland.

MR. FISHER: In deep shade?

MR. LEACH: I wouldn't say so. The slats are spaced one and a half times their width. I suppose the total shade would be 50 per cent.

MR. FISHER: It would be close to the foot candles in the frame?

MR. LEACH: I couldn't say, because I have never measured the foot candles in the outside beds. I had no further interest in it.

MR. FISHER: That is a point I would like to know. You hear everybody get up here and tell about "we shade" and "we don't shade."



How much do we shade, and why? Is there any experimental evidence of stress put to a plant in rapidly changing lighting intensities? For instance, say in the greenhouse bench when you denuded the cutting, when you move them from 350 foot candles maybe to 1,000 to 2,000 or a bright sunshine, is there any experimental evidence or references someone can refer me to, to get some basic thinking on this thing? I have some, but I can't substantiate it. I would like to find some references.

MR. LEACH: As far as the propagation in the frame is concerned it is 350 foot candles. As far as I would be concerned from the standpoint of propagation, I wouldn't be concerned with the foot candles afterward as long as the cuttings were shaded and didn't burn. I don't think I understand the point of the foot candles after they are transplanted out of the frames.

MR. FISHER: The point I would like to know is how much stress in the change of light intensity can a young plant stand?

MR. LEACH: The limit of tolerance — I don't know.

MR. HOOGENDOORN. Does the frame come as a unit or is it something you can build yourself?

MR. LEACH: I am not here to sell anything. I wrote a book on rhododendrons I have blueprints for the frame in the book. If anyone wants to build these frames I have extra copies of the blueprints.

PRESIDENT SCANLON: Thank you, Mr. Leach, for your description of the Nearing propagation frame and of your results with rhododendron propagation.

The meeting is adjourned until the afternoon sessions.