

poses. We have found these procedures for seed propagation give us very good results.

OPEN-FIELD PROPAGATION OF JUNIPERS

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I appreciate the opportunity to be with you today to discuss the subject of outdoor propagation — open-field propagation — of hardwood juniper cuttings. The idea is not original with us, although it is original in the geographical area of our nursery. In the early 1920's, a firm known as D.E. and J.O. Kelly Nursery began propagating in this manner, and since that time, almost every nursery in the area has attempted it. Most have been fairly successful because it is a simple method. Now, not so many are doing it for two reasons: more people are using the more modern methods of propagation such as mist, and the lack of consumer demand for junipers seems to have slowed somewhat the need for propagation.

We are in the very center of North Alabama, Zone 7, where temperatures sometimes drop to zero, but ordinarily are not quite that cold. Overall we have a very moderate climate. We have a fraction over 50 inches of rainfall annually in normal years. Our soil is a heavy, red-clay type. I think all these factors are important in considering how we propagate because, really, we let Mother Nature do the worrying.

A list of cultivars that we are propagating in this manner will give you an idea of the range we can do. We root a wide range of junipers, beginning with the naturally-layering types, such as *Juniperus horizontalis* 'Glauca', *J. conferta*, and *J. horizontalis* 'Plumosa. Other cultivars include *J. chinensis* 'Pfitzeriana', *J. virginiana* 'Kosteria', *J. chinensis* 'Pfitzeriana Compacta' and *J. chinensis* 'Hetzii'. Several *Juniperus communis* cultivars root well; some of these are *fastigata*, 'Hibernica', 'Ashfordii', 'Kiyonoi', and 'Suecica'.

There are certain cultivars for which this method of propagation is not successful, and one of the most obvious for us is the *J. chinensis* 'Pfitzeriana Aurea'.

Generally, our procedure is this: From vigorous, well-cared-for plants, we take cuttings of the current season's growth, approximately 8 to 10 inches long. The length varies with availability of the wood. The second cuttings would be just as easily rooted as the tip cuttings and sometimes root more easily. These cuttings are made in the field. In other words,

they are shaped, they are cut the proper length, and top is removed, eliminating the need to come back and top them later. The branches on the lower third can be removed, wounding the cutting. However, we prefer to leave all the limbs, finding no rooting advantages in the wounding, and this gives definite advantages for extra freeze-proofing. The more limbs, the less heaving we see.

The cuttings are gathered in big burlap bags and moistened unless the wood is wet from rain or dew. We do not allow the cuttings to dry out. The cuttings are carried in these bags, one cultivar at a time, to the field.

To prepare the soil for planting, we turn it in late summer and work it to prepare a seed bed situation. After a rain and just before planting, we disc again, then lay off rows as they are needed to avoid allowing them to dry out.

If the soil lacks moisture, we put water into those rows with a water wagon before sticking. We have a 550-gallon water wagon, tractor drawn, which can wet four rows, 220 feet long, per 550 gallons of water. Into that muddy soil, we stick the cuttings. In the planting we have just completed, there was enough natural moisture in the soil that we felt the water was not necessary. Sticking the cuttings is then much easier, but in most years additional water is necessary.

The cutting is stuck about halfway into the soil, so that 2 to 3 inches of the top are left above the ground after we have completed the planting procedure. It is important to lay the row off to the proper depth, so that the man who is sticking can gauge depth as he is pushing cuttings into the ground. The cuttings are put as close together as possible in the row, although it would be better to space cuttings 1 inch to 1-1/2 inches apart, if land were available.

The next step is to push the soil together with a garden rake, or something of that nature, on either side of the row to hold the cutting more firmly into the ground. This is really a filling process of the row, and holds the moisture in if we have added water. If the soil is already moist, it supports the cutting in an upright position.

We then come in and do what we call "foot-packing." Each man takes a row and, using his weight and the heels and soles of his shoes, compresses the soil so that the air is pushed out, seating the plant solidly in the ground. This, we think, is one of the most important factors of the whole propagating process; that is, the plant must be solidly seated in the ground.

Every year we have used the next step, we have had good luck. We use a vehicle to compress the soil even more firmly — any light car or pickup will do. Each side of each row has a

wheel driven right against the plant; we really pack the cuttings in the ground, so that if you grasp a cutting by the tip and pull on it, the tender top will break off. We have done this for 15 years with good results.

Occasionally in the winter, we might have to repack the cuttings with a vehicle or by foot, whichever is necessary, if freezing and thawing cause heaving problems. We feel the cutting must remain in firm contact with the soil, and the air pocket left under the cutting after a lifting freeze is definitely detrimental to the rooting process.

This past winter (1977) we had a problem with heaving; for the first time in all these years we lost our crop. It has not made us lose faith in the process, but we do know that we cannot do it in terribly cold winters when the ground stays frozen for a long period.

Following packing would be the time to top cuttings, if needed, although normally we don't do it. Finally we plow the area with a little Super A or 140 tractor, just to break the hard-packed soil in the middles, which was the result of foot traffic and vehicle movement over it. We leave the field in very nice condition after the planting process.

Now, this is all done in the fall, beginning about mid-September and extending until we begin digging. We have successfully planted until Christmas. The amount of time we spend sticking cuttings depends on two things: how much wood we have, and how much open weather we have before we start digging our fall orders.

We feel that as soon as they have had a good rain on them, we can pre-emerge these cuttings with Dacthal — something very mild. We don't want to put any strong herbicides on them since they are unrooted cuttings. There might be some inhibition of rooting from a herbicidal application, so we want to be very careful.

Through the summer months we cultivate these cuttings with the small tractor. Because the cuttings are firmly in the ground, we can hoe across the row with fork hoes, pulling from the plants any soil piled up by the tractor. It is important to avoid mounding soil on the cuttings. Irrigation is used during the summer as necessary.

Between the middle and the end of September, we root prune these cuttings, using a U-shaped digger blade that is about 12 inches wide. We like to find a period when rain is forecast, and there is some moisture in the ground. We try to cut off the roots that have been formed through the spring and summer at about 12 inches, six inches from the plant each way. This early fall root pruning promotes a tremendous amount of

new growth of the roots, so that when we begin to ship the plants after frost, about the 15th of October, they are well-rooted plants.

These plants are then pulled, graded, bunched into 25's as orders come in for them. We prefer shipping directly from the field, avoiding any long period of warehousing.

An advantage of this system is that we are producing a very heavy, strong, hardy' liner, exposed to field conditions from its origin; and nurseries who buy it can turn it into money. In a container or in the field, it will survive and it will grow and do well. Of course, for us, there are some other reasons we grow junipers in this way. We think this method fits our schedule nicely. When we end cultivation and other summer activities, it gives us a procedure that takes two or three weeks, is productive as far as sales go, and fills the need of something for our men to do at that time.

We can stick approximately 100,000 cuttings to an acre in this manner, using rows 42 inches apart. To our thinking, it is a very cost-effective means of propagating. We are constantly searching for less expensive ways to propagate plants — for ways of growing and handling plants that are more cost-effective and more efficient.

Certainly, in an open field propagation, we avoid the need for greenhouses, especially heated greenhouses; we have little need for water or irrigation, and we give hardly any attention to these plants through the summer other than general culture. We use no rooting hormones. We fertilize in the spring to encourage growth. The rows are watered before sticking the cuttings, but there is no more watering unless it is absolutely essential. We expect an overall average rooting of 80%.

This procedure generally is the way we do all our hardwood cuttings. Of course, the timing is varied, but many plants are rooted in this way. Crape myrtle is one of our biggest items and others we root are *Hibiscus syriacus*, *Euonymus kiautschovicus* 'Manhattan', *Thuja occidentalis* 'Woodwardii', *Forsythia* × *intermedia*, *Spiraea* sp., *Punica granatum*, *Buxus*, and other flowering shrubs.

Botanical names and common names of plants mentioned:

Buxus sp. — boxwood

Euonymus kiautschovicus 'Manhattan' — Manhattan euonymus

Forsythia × *intermedia* — forsythia

Hibiscus syriacus — althea

Juniperus chinensis 'Pfitzeriana' — Pfitzer juniper

Juniperus virginiana 'Kosterii' — Koster juniper

Juniperus chinensis 'Pfitzeriana Compacta' — Nick's compact Pfitzer juniper

Juniperus chinensis 'Hetzii' — Hetz juniper

Juniperus chinensis 'Pfitzeriana Aurea' — gold tip Pfitzer juniper

Juniperus communis 'Ashfordii' — Ashford juniper

Juniperus communis 'Hibernica' — Irish juniper
Juniperus communis 'Kiyonoi' — Kiyono juniper
Juniperus communis 'Suecica' — Swedish juniper
Juniperus conferta — Shore juniper
Juniperus horizontalis 'Glauca' — Sargent's blue juniper
Juniperus horizontalis 'Plumosa' — Andorra juniper
Lagerstromia indica — crape myrtle
Punica granatum — pomegranate
Spiraea sp. — spirea
Thuja occidentalis 'Woodwardii' — Woodward globe arborvitae

MIXING ROOTING HORMONES

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By definition, "plant hormones" are chemicals occurring in living plant material that affect plant growth. Chemicals affecting growth that have not been isolated from living plant material are called "growth substances". For the purpose of this paper, both types of chemicals will be referred to as "hormones".

The process of mixing rooting hormones is a relatively new one, which affords the convenience of having on hand a wide range of concentrations and combinations of several rooting compounds. These various concentrations and combinations can, and should, be used to compare results produced on any given crop which is to be rooted in your nursery.

All of the compounds most commonly used as plant hormones are readily available from chemical supply houses (1) both in bulk or as pre-weighed samples. Naturally, the bulk material is least expensive.

Our first procedure deals with mixing rooting hormones with talc. I will use 3-indolebutyric acid (IBA), as an example. A brief look at the mathematics involved shows:

To make 100 gms. of 1.0% (10,000 ppm) IBA in talc combine 1 gm. IBA and 99 gms. talc

To make 100 gms. 4.5% (45,000 ppm) IBA in talc combine 4.5 gms. IBA and 95.5 gms. talc

A small amount of rubbing alcohol (70% isopropyl) is used to dissolve the IBA in a small container. This is poured over the talc in an electric blender. Additional alcohol is used to rinse the IBA container to be sure all of the IBA is recovered; this rinse is added to the talc. Sufficient alcohol is then added to the mix to make a thin, creamy mixture. This mixture is blended at high speed for 4 to 5 minutes.