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JUNIPER PRODUCTION WITHOUT HERBICIDES

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Let me say at the outset that I am not against herbicides nor am I against the use of them. In fact our nursery makes limited use of herbicides such as Devrinol, Gramaxone, Ronstar, Roundup, Simazine, and Treflan. Devrinol and Ronstar are on a trial basis only because neither of these are registered for nursery use in Canada. Ronstar probably will not be registered since the manufacturer is reluctant to spend the money required to have it tested. The estimated cost to obtain a label for a crop is about $1,000,000.

As I mentioned, we are not against the manufacture or the use of herbicides, but we are against the reckless use of chemicals. Many farms in our land are suffering from a shortage of earthworms and beneficial bacteria, the "living phase" of the soil, so vital to produce superior crops.

God did not intend for us to abuse the soil, rather we are to be good stewards of it. Future generations will also need to make a living from the land. I believe that the fewer chemicals we use the better off we are.

We have found that certain *Malus* and *Tilia* cultivars, for examples, will react to Gramoxone (Paraquat). We also suspect that with a heavy rainfall, severe stem splitting can occur on *Acer platanoides* 'Crimson King' after Gramoxone treatment. In order to obtain good weed control in containers when using Ronstar G you must use the high rate of 200 lb/acre which will discolor the plant to the point where blue or green becomes grey and plant growth is reduced. It has also been our

experience that it is virtually impossible to produce junipers on land where a high rate of Atrizine has been used on previous crops such as corn. These are some of the reasons why we limit the use of herbicides.

Allow me then to show you how we produce our conifers, junipers in particular, without herbicides and still manage to make a profit. We begin at our propagation department. Cuttings are taken from first and second year blocks only, never from saleable plants.

After rooting has taken place the cuttings are potted into peat pots, 36 to a flat and placed into polyhouses were they are grown for the season. The houses are then covered with a 4 mil opaque poly for winter protection. All of our peat-pot liners are covered with an additional sheet of poly for added protection, the idea of a tent within a polyhouse. (Table 1).

Table 1. Costs involved in producing rooted cuttings and grafting understocks of juniper.*

Materials and Labor	Cost per plant	
	Rooted cutting	Grafting understock
Cost of cutting	$0.04	$0.06
Take cuttings, cut, dip & stick	0.06	0.06
Rooting medium	0.005	0.005
Heat & hydro	0.04	0.04
Greenhouse plastic	0.01	0.01
Allowance for losses — 20%	0.03	0.035
Pots — peat pot/whale hide pot	0.03	0.06
Potting	0.03	0.03
Soil	0.03	0.03
Chemicals & fertilizers	0.01	0.01
Polyhouse plastic	0.005	0.00
Weeding	0.005	0.005
Irrigation	0.01	0.01
Depreciation, land, repair & maint.	0.015	0.015
Overhead & administration*	0.00	0.00
Total cost	$0.32	$0.37

* Calculated at the end of the production cycle

For grafting understocks we use *Juniperus virginiana* 'Glauca Hetzi'[1]. When rooted, these cutings are potted into long-lasting Whale Hide pots, which will last long enough to take the plants through the grafting procedure and into 1-gal containers. These plants are also placed into polyhouses but are then brought back into the greenhouses in October or November in order to prepare them for grafting (Table 1).

The grafting process is the standard method used in most nurseries. We use a side veneer graft and place them in bot-

[1] Bot. Ed. There is no such name; this is either *J. virginiana* 'Glauca' or *J. chinensis* 'Hetzii'.

tom heated ground benches covered with poly to make a humidity tent which allows for quick callusing. Ventilation takes place after good callusing has occured and the plants begin to grow. The poly is completely removed when the understock is pruned back. In May we pot all grafted stock into 1-gal containers; these are placed in polyhouses for summer growing and are then covered for winter protection (Table 2).

Table 2. Costs of propagating junipers by grafting.

Materials and Labor	Cost per graft
Cost of understock	$0.37
Pruning of understock	0.03
Taking scions	0.02
Grafting	0.16
Peat moss	0.01
Greenhouse plastic	0.025
Heat & hydro	0.095
Allowance for losses — 5%	0.035
Pruning & elastic removal	0.05
1 Gal.* containers	0.17
Soil	0.15
Potting	0.08
Polyhouse plastic	0.015
Miscellaneous supplies	0.02
Labour — weeding, irrigation, spraying	0.01
Depreciation, land, repair & maintenance	0.06
Overhead & administration**	0.00
Total cost	$1.30

* trade designation
** calculated at the end of the production cycle.

Cuttings and grafted liners are usually planted in the field in late May after the spring shipping season. The soil is prepared in the conventional manner: plowing, fertilizing, discing, cultivating, and harrowing. The cuttings are then planted by machine and secured by firming the soil around the plant by foot to insure quick moisture uptake. The plants are then irrigated very thoroughly. In extremely hot weather, as is sometimes the case in May, we treat the plants with an antidesiccant. This is done prior to planting. By following these practices we seldom lose a plant (Table 3).

Grafts are planted by hand since they are in 1-gal containers. Furrows are drawn in the field and the plants are planted at a spacing of 4 ft × 18 in. Once planted, the grafts are thoroughly soaked with about 2 in of water. We do not plan to develop a machine for this job because we are going to shift the production of all junipers from the field to containers.

After-care includes pruning, spraying, and cultivating. Pruning is done annually right after the snow has disappeared

in late winter. Hedge clippers are used for most prunings. The upright junipers receive one final pruning in mid-August, just prior to becoming saleable. This is always done by knife to avoid unsightly pruning marks made by the hedge clippers.

Table 3. Production costs for field-grown junipers.

Cost factors	Upright *junipers*	Spreading *junipers*
Land*	$0.075	$0.075
Fertilizers & green manure	0.08	0.08
Soil preparation	0.015	0.015
Plant	1.30	0.32
Planting	0.15	0.075
Irrigation	0.03	0.03
Cultivation	0.055	0.055
Hoeing	0.20	0.20
Pruning	0.52	0.30
Spraying	0.01	0.01
Allowance for losses — 10%	0.24	0.12
Pots	0.61	0.49
Digging	0.40	0.40
Grading & labels	0.05	0.055
Polyhouse plastic	0.125	0.125
Order assembly & loading	0.40	0.30
Depreciation, repair & maintenance	0.30	0.30
Overhead & administration — 12%	0.57	0.37
Total cost	$5.13	$3.32

* based on land rental of $100 per acre

Spraying is done by using modified peanut sprayers. These sprayers are used in our entire nursery and are modified by changing the mist blowers to pivot up and down as well as being able to rotate from left to right. Chemicals such as Benlate, fixed copper, Kelthane, and Thiodan are used to protect plants from juniper tip blight, mites and insects. We try to limit ourselves to three sprayings per season beginning in late June.

Cultivation is done on a regular basis, mostly with 140 International tractors. We have one 140 International Hi-Clear which is used extensively on the taller growing plants. Once the evergreens become 36 in or more in height we make use of our Poly-Bob tractor which is completely adjustable by means of hydraulics. This machine has a clearance of 8 ft and is capable of cultivating trees up to 9 and 10 ft tall, depending on their ability to flex. After a rainy spell, when the weed seeds have germinated and we have been unable to cultivate, we have to go through the rows twice to cover all the weeds. The idea is to cover the weeds with soil in order to choke them. We try to hoe right after cultivating when the soil is loose and easy to move. In late fall when cultivation is impossible we

still hoe. Seeds of such weeds as shepherd's purse, chickweed, and grasses will germinate and grow even at low temperatures. It is important to clear them away from the plants to avoid that extra work in the spring. It also helps to keep the mouse population to a minimum.

We plant 2 rows of low growing plants between our blocks of uprights. This practice is followed throughout the nursery in all tall growing crops. Our blocks are at 40 ft spacings, 10 rows of 4 ft. This spacing enables us to reach our plants easily with fertilizer, pesticides, fungicides, stakes, etc. At harvest time these rows are removed first and the space becomes a roadway which makes digging and removal of the plants more efficient.

Most of our evergreens are dug by hand and placed into fiber pots. We first undercut the rows of plants with our rootpruner; this makes the task of lifting plants easy since all tap roots are cut. It is then a simple procedure to dig around the plant and lift the soil ball into the pot, firming it with the handle of the spade. The plants are then soaked by irrigation within 12 hr of digging unless, of course, natural rainfall occurs within that time. We believe that this watering is of utmost importance for a high survival rate and top quality. We did develop a 2-row digger for this job but found that it was just as efficient to dig by hand.

Most of the evergreens are graded in the field. This makes storage and assembling of orders more efficient. It also reduces grading costs. It is very easy to grade in the field because of the available space. Plants below the acceptable standard are not tagged and are placed in a separate polyhouse. These plants are then pruned and spaced the following spring and allowed to grow on in the pot until they become saleable, which is usually after one flush.

All of our saleable blocks of evergreens are dug in the fall and brought into polyhouses for the winter. We use wagon trains to haul them out of the fields. Our road laws restrict us to 65 ft so we have built wagons with two layers instead of one. These wagons, of course, will only carry spreading junipers on the bottom layer and total an average of 220 11-in pots.

All our polyhouses used for winter storage are covered with opaque plastic to minimize temperature fluctuations. In early spring when temperatures climb we vent our houses first by opening the top-half of the Dutch doors. When high temperatures persist we vent the center of the house by cutting round holes in the plastic. When all danger of snow and severe weather is past the poly is removed.

The bulk of our orders are shipped out on 4 × 8 ft skids with 2, 3, or 4 layers, depending on the type of stock to be loaded. These skids are filled right at the polyhouses. The plants are not handled again, thus giving a substantial saving of labour while keeping freight losses negligible. Six thousand pound forklifts are utilized to carry the skids to the assembly areas and to load the trailers. Eleven of these skids fill a 45 ft trailer.

In answer to the question, "are herbicides really necessary?", many people believe they are; but I wonder if these people calculate the cost of the herbicides and tally up the losses over the years in actual damage and/or reduction in growth, poor appearance, etc. In my opinion, if we can produce plants without herbicides and can continue to be competitive, I prefer to do without them and believe them unnecessary in our industry. To stay competitive we may have to develop systems that are much more labour saving to offset the added expense of cultivation and hoeing.

WILL THE PROPAGATOR HAVE THE PESTICIDES HE NEEDS NEXT YEAR?

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Will you have the pesticides you need next year? My answer is maybe! Many of you will have the most of the pesticides you need for next year. However, some of you will not be able to obtain or use specific pesticides that you would like to have.

With the passage of the 1972 amendments to the Federal Insecticide, Fungicide and Rodenticide Act, nurserymen began experiencing difficulties in obtaining the pesticides they needed to: 1) produce healthy vigorous plants, and 2) to meet state or federal quarantine certification requirements. Keep in mind that under the first need, you, like other segments of agriculture, are only interested in efficient control of the common pests so that your nursery plants are healthy, vigorous, and of a good quality that will readily sell. In contrast, under the second need, you have to maintain your plants completely free of some hazardous pests. These are specific pests not widely distributed in the United States. Historically, the nursery in-