New Stocktypes and Advances in the Container Industry: A Grower's Perspective

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Abstract

Through the development of new container types, the implementation of new cultural practices and the continuing improvements in equipment and materials, the quality and type of containerized forest seedlings has changed significantly over the last ten years. This paper briefly covers the technology that is currently being used operationally to grow container forest seedlings and attempts to identify the new trends shaping the container forest industry.

Keywords

Plug Seedlings, P+1, seedlings, and history

Introduction

The technology needed to grow good quality forest seedlings in containers has been developed over the last thirty years. Container grown seedlings are now being grown globally for a wide variety of tree species as well as a wide range of climatic conditions. In the Pacific Northwest, the technology available to growers for raising container forest seedlings has been developed through a combination of innovation as well as imitation. Early examples (in the decade of the 60's) of technology developed in other parts of the world were the "Ontario tubes" and the "Walter's bullets". Both of these examples were single cell containers. The decade of the 70's brought us the development of the Styroblock® in Canada and the Multipot® in Sweden. Incremental design improvements were also made during that time, such as the "ribs" in the internal wall of each container cell used to guide the roots down towards the drain hole.

Meanwhile in the Pacific Northwest, aerial seeding reached its greatest use in 1970, when 112,000 acres were seeded. The same year a total of only 900,000 container seedlings were produced in the area. (Ter Bush 1974). By 1971 the Plug+1 stocktype was introduced at the Ray Leach Nursery in Aurora, Oregon, and by the second half of the decade the Georgia Pacific Corporation was transplanting container seedlings grown in their Cottage Grove nursery at the Tyee Tree Nursery near Roseburg, Oregon (Hahn 1984). Growers such as Phil Hahn, have greatly contributed to our better understanding of the use of container plug seedlings in the production of Plug+1 seedlings. After almost thirty years since the initial experimentation with plug transplanting, the Plug+1 stocktype is still one of the most popular and reliable stocktypes available in the region.

Also, it is important to mention the great work done by seedling researchers Dr. Yasu Tanaka and Dr. Dick Tinus. They have greatly contributed in the advancement of our knowledge by providing us with the morphological and physiological scientific information needed to produce better container seedlings

Factors Affecting Container Seedling Quality

There is a popular saying in reforestation that goes something like this: "There are a thousand ways to kill a seedling, but unfortunately, it only takes one". Both producers and users of seedlings are familiar with the morphological and physiological parameters that define a good quality container seedling at a given time. It is important to recognize that there are other factors that can contribute to the failure of a seedling. For example, there is potential physical damage that could occur to the seedlings during storage, shipping or planting. Other factors such as site preparation, weed control, and animal browsing could also contribute to the success or failure of a seedling in the field.

Seedling morphology and physiology at the time of harvest

Morphological characteristics are easily measured. By comparing these measurements, we can calculate shoot to root and caliper to height ratios. These ratios give us an idea of what constitutes a well balanced seedling at a given point in its development. Additional morphological characteristics can also be visually recognized, such as well-developed buds, woody stem tissue, root systems, dark green tissue and, sometimes, the presence or absence of diseases. On the other hand, physiological characteristics are not easily detected visually, so various laboratory tests have been developed to show us in a quantifiable way, characteristics like frost hardiness, root growth potential and bud dormancy. Both morphological and physiological characteristics are important in order to ensure good field survival and growth.

Current Technology Available to Produce Container Seedlings.

Numerous technological improvements have been made in the last ten years which have allowed the nursery grower to produce good quality seedlings on a consistent basis. Some of the areas where improvements have been made can be classified into four general groupings:

- Nursery cultural practices.
- Materials used: media, fertilizers and mycorrhiza.
- Equipment used: container types and growing facilities.
- Improved field-planting techniques, from better planting scheduling to improved animal repellents.

Nursery cultural practices

One of the areas where a lot of improvements have been made is in the use of light. Both the addition of light at night during the beginning of the growing cycle and the removal of light at the end of the growing cycle have proven to be valuable growing techniques.

The addition of light in early spring ensures that species with a provenance of northern latitudes or higher elevation do not set a bud early in the year. This is done by the use of artificial light during the night in strong enough amounts so the bud initiation process does not start.

A newer technique in forest nurseries is aimed at limiting the duration of the daylight in the late summer or fall to induce the plant into an early and more uniform bud set. This technique is commonly known as "black-out". This technique has been around in the horticulture industry for a long time as a tool to induce flowering at the proper time. As an example, the timing of the Poinsettia flowering at Christmas is due to the use of blackout. The proper timing and duration of blackout on some low elevation, southern latitude seedlots still needs further research.

Materials used

The improvements made by manufacturers to the materials used by the container forest nursery industry have been many and they all contribute to the better production of container seedlings. Worth mentioning are slow release fertilizers, new media mixes, and the availability of commercial quantities of the proper mycorrhiza spores.

Equipment used

This is possibly one area where the greatest amount of change has occurred. Significant improvements have been made to practically all the machinery used at the nursery: from seed hi-grading equipment to precision single seed sowing machines. Two areas worth mentioning are the new container types available and the introduction of the concept of "working roofs" in the greenhouses.

Containers

Container types remain one of the areas of greatest progress and well as one where the greatest amount of confusion exists. Numerous new container types have been introduced in the last few years, but, due to the lack of a standard name nomenclature, they end up being referred to by the name of the manufacturer (Styroblocks, Hiko, Jiffy, etc.). This name is usually followed by a number describing the volume, sometimes in metric and sometimes in English (265 cc., 8 cu. Inches). The variations that exist between container types have more to do with their design (volume, density, depth, diameter, drainage and root pruning) than the materials from which they are made. The majority of blocks and cellstypes are made of plastic except Styroblocks which are made of expanded polysterene, and Jiffy Forestry Pellets, which are made of compressed sterile peat media.

As we can see on Table 1, there is a wide range of containers to choose from. Cavity volume is the most widely used characteristic to differentiate between them. Other important differences involve the methods used for root pruning (copper, slit openings, etc).

"Working roofs"

Conifer seedlings grow better when exposed to full sunlight during the growing phase. Ways to do that include: having the seedlings grown outside, manually removing the greenhouse covering during the summer, or using new versions of greenhouses where the roof opens or closes as the weather fluctuates. This last group of new greenhouse structures are referred to as "working roofs."

Improved field planting

Improvements have been made at the time of field planting that have greatly added not only to seedling survival but also to initial growth. Some of these improvements include: slow release fertilizers, animal-browsing repellants, better weed control, and early fall planting.

Where is the Industry Going? The Search for the New "Target Seedling".

The industry seems to be moving towards producing a large one year old container plug that could possibly come to replace the use of the two year old Plug+1 (seedlings grown for six months to a year as a plug and an additional year as a bareroot transplant). The size of the container and the resulting size of the plug seedling will be shaped more by economic factors (cost per M and cost of planting) than by limiting factors such as container volume. This new large stocktype could be achieved by either direct seeding into larger containers or sowing into small containers which are later transplanted into large containers.

Conclusion

Numerous technological changes have been introduced in the container nursery industry over the last ten years. Competition is fostering innovation. Globalization forces could potentially drive small producers out of business with the long-term effect of limiting consumer choices.

Regardless of what each nursery grower claims his or her seedlings are capable of doing in the field, the bottom line remains:

Table 1. Seedling containers sorted by cavity volume

Brand/Type	Name	Number of Cavities per Block	Cavity Depth in.	Cavity Volume cu. in.	Cavity Density cells/sq.ft.	Soil Required cu.ft./1000 cavities
HIKO Trays	V-13	135	1.9	0.8	171.0	0.46
Jiffy Forestry Pellets	18mm	300	1.7	0.9	203.0	n/a
Beaver Plastics Superblock	1 - 448/18	448	2.8	1.1	196.2	0.64
IPL - Rigi-pots	IP25	126	3.1	1.5	153.7	0.87
Beaver Plastics Superblock	1.5 - 312/24	312	4.5	1.5	137.0	0.87
Jiffy Forestry Pellets	25mm	162	2.6	2.4	105.0	n/a
Beaver Styroblock Classic	2 - 192/40	192	4.5	2.4	97.8	1.39
Beaver Plastics Superblock	2A - 240/40	240	4.5	2.4	105.9	1.39
Ropak Multi-Pots	#5-104	104	3.5	3.0	112.0	1.74
Ray Leach “Cone-tainers”	RLC-3 Cells	200	4.8	3.0	100.0	1.74
Jiffy Forestry Pellets	28mm	128	2.6	3.1	83.0	n/a
HIKO Trays	V-50	67	3.4	3.1	82.0	1.79
HIKO Trays	V-50 SS	67	3.4	3.1	82.0	1.79
IPL - Rigi-pots	IP50	67	3.5	3.1	78.8	1.79
Beaver Plastics Superblock	4S - 160/60	160	4.1	3.3	70.6	1.91
Ropak Multi-Pots	#1-67	67	3.5	3.5	79.0	2.03
Jiffy Forestry Pellets	30mm	105	2.6	3.7	68.3	n/a
Beaver Plastics Superblock	4A - 198/60	198	5.2	3.7	87.3	2.14
Spencer-Lemaire Rootrainer	Fives 65-5	5	4.2	3.8	81.8	2.20
Beaver Plastics Superblock	4 - 160/65	160	5.0	3.9	70.6	2.26
IPL - Rigi-pots	IP65	67	4.8	4.0	78.8	2.31
Ropak Multi-Pots	#2-67	67	4.8	4.0	79.0	2.31
Ray Leach “Cone-tainers”	RLC-4 Cells	200	6.3	4.0	100.0	2.31
Beaver Styroblock Classic	5 - 120/80	120	6.0	4.5	61.1	2.60
Airblock	410	112	4.1	4.9	49.0	2.84
Beaver Plastics Superblock	6S - 112/80	112	4.1	4.9	49.4	2.84
Jiffy Forestry Pellets	36mm	84	3.0	5.5	54.9	n/a
HIKO Trays	V-90AB	40	3.5	5.5	49.0	3.18
IPL - Rigi-pots	IP90	45	4.0	5.5	52.9	3.18
Beaver Plastics Superblock	5.5-160/90	160	6.0	5.5	70.6	3.18
HIKO Trays	V-93	40	3.4	5.7	49.0	3.30
Beaver Plastics Superblock	6 - 112/105	112	5.9	5.7	49.4	3.30
Ropak Multi-Pots	#3-96	96	4.8	6.0	41.0	3.47
Ropak Multi-Pots	#6-45	45	4.8	6.0	54.0	3.47
Spencer-Lemaire Rootrainer	Hundred 100-5	5	4.2	6.1	58.4	3.50
Jiffy Forestry Pellets	42mm	50	2.6	6.7	32.5	n/a
IPL - Rigi-pots	IP110	45	5.0	6.7	52.9	3.88
Ray Leach “Cone-tainers”	RLC-7 Cells	98	5.5	7.0	49.0	4.05
HIKO Trays	V-120SS	40	4.3	7.3	49.0	4.22
Beaver Styroblock Classic	7 - 160/120	160	9.0	7.3	70.6	4.22
Beaver Plastics Superblock	8L - 91/130	91	6.0	7.5	40.1	4.34
Beaver Styroblock Classic	8 - 80/130	80	6.0	7.5	40.7	4.34
Beaver Plastics Superblock	I0S - 77/125	77	4.6	7.6	34.0	4.40
Ropak Multi-Pots	#4-96	96	6.6	9.0	41.0	5.21

(Table 1 continued)

Brand/Type	Name	Number of Cavities per Block	Cavity Depth in.	Cavity Volume cu. in.	Cavity Density cells/sq.ft.	Soil Required cu.ft./1000 cavities
HIKO Trays	V-150	24	3.9	9.2	29.4	5.32
HIKO Trays	V-150 SS	24	3.9	9.2	29.4	5.32
Beaver Plastics Superblock	10 - 77/170	77	6.0	9.8	34.0	5.67
Ray Leach "Cone-tainers"	SC-10 Cells	98	8.2	10.0	49.0	5.79
Ray Leach "Cone-tainers"	SC-10 Cells	98	8.2	10.0	49.0	5.79
Spencer-Lemaire Rootrainer	Hillson 170-4	4	5.0	10.5	37.4	6.10
IPL - Rigi-pots	IP200	25	4.8	12.2	29.4	7.06
Beaver Plastics Superblock	I5S - 60/220	60	4.7	13.4	26.5	7.75
IPL - Rigi-pots	IP220	36	5.1	13.4	25.4	7.75
Jiffy Forestry Pellets	50mm	32	3.7	15.3	20.8	n/a
Beaver Plastics Superblock	15 - 60/250	60	6.0	15.3	26.5	8.85
Deepots	D16	25	7.0	16.0	30.0	9.26
HIKO Trays	V-265	28	5.9	16.2	34.2	9.38
HIKO Trays	V-310	15	3.9	18.9	18.4	10.94
IPL - Rigi-pots	IP320	15	4.8	19.5	17.6	11.28
Beaver Plastics Superblock	20 - 45/340	45	6.0	21.1	19.8	12.21
IPL - Rigi-pots	IP350	25	5.5	21.3	17.7	12.33
HIKO Trays	V-350	15	4.9	21.4	18.4	12.38
Spencer-Lemaire Rootrainer	Tinus 350-4	4	8.0	21.5	32.3	12.40
Beaver Plastics Superblock	28 - 45/450	45	8.0	26.8	19.8	15.51
Beaver Plastics Superblock	30 - 28/500	28	9.0	31.7	12.3	18.34
HIKO Trays	V-530	15	7.9	32.3	18.4	18.69
Deepots	D40	20	10.0	40.0	20.0	23.15
Beaver Plastics Superblock	45 - 20/700	20	9.0	43.3	8.8	25.06
Spencer-Lemaire Rootrainer	Super 45 750-3	3	10.0	45.9	21.8	26.60
Beaver Plastics Superblock	60 - 15/1000	15	6.0	61.0	6.6	35.30
HIKO Trays	V-1300	6	5.5	79.3	6.6	45.89
Beaver Plastics Superblock	Gal - 8/3000	8	7.0	195.0	3.5	112.85

- How much do they cost?
- Do they survive?
- How fast do they grow?

Acknowledgments

Stuewe and Sons, Inc., distributor of nursery containers, provided us with the information on Table No.1.

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