Seedling production in mini-cell containers in Quebec

Denis GLINAS
Pepiniere forestiere de Grandes-Piles
Ministêre de l'Energie et des Ressources du Quebec

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Abstract

Quebec's Grandes-Piles tree nursery has begun production of seedlings (for subsequent transplant) in mini-cell containers. An initial experiment was carried out with various species using the *Ecopot # 305* container. As a result, cultural techniques were adjusted and a second experiment was carried out : the *Kord # 200* container got better results with all species studied. Since 1989, the Grandes-Piles nursery has seeded its entire bareroot production (except larch) in mini-cell containers. Given the improvements that have been noted with respect to germination, seedling quality and plant growth, the choice seems justified. The practice can even reduce turnover times. The use of precision seed drills, pre-germinated seeds and appropriate cuttings and containers should result in further improvements. Other techniques (chemical root pruning and the addition of a binding agent in the substratum) also look promising for the future development of "mini-cell" production.

Résumé

La production de plants en contenants mini-cellulaires au Quebec. Au Quebec, la pepiniere de Grandes-Piles a entrepris la production de semis de repiquage issus de contenants mini-cellulaires. Un premier essai a ete conduit avec le *recipient* Ecopot # 305, *sur differentes essences.* Cette *premiere experience permettait d'ajuster les techniques de culture pour lancer un second essai. Le recipient* Kord # 200 *obtenait les meilleurs resultats sur toutes les essences evaluees. Depuis 1989, la pepiniere de Grandes-Piles ensemence toutes ses productions a racines hues (sauf* le *meleze) dans des contenants mini-cellulaires. Les avantages relies* a *la germination, a la qualite des semis de repiquage et a* /a *croissance des plants justifient* ce *choix. Cette methode peut marne raccourcir* /a *rotation. L'utilisation de semoir de precision, de semences pregermees, de boutures et de recipients appropries contribuerait a ameliorer les performances de ce mode de production. D'autres techniques, telles* /e *cernage chimique des racines et /'addition d'agent liant dans* /e *substrat constituent aussi des avenues interessantes pour developper la culture en contenants mini-cellulaires.*

Introduction

Quebec's reforestation programs have been stepped up considerably in recent years. The 1984 production figure of 71 million plants rose to 241 million by 1988. Containerized production became the main cultural method, and bareroot production was faced with new requirements. For example, minimum plant height was increased from 15 cm to 25 cm. With traditional production techniques ill suited to meet new objectives, it was necessary to develop other methods.

With the advantages of containerized production in mind, the Grandes-Piles nursery began producing transplant seedlings in mini-cell containers. The plants are seeded in tunnels and subsequently transplanted along with substratum. The following pages of this document examine the results of the Grandes-Piles project, as well as operational aspects and perspectives for the future development.

Experiments

The first experiment was carried out with the *Lannen* system from Finland. The container was the *Ecopot # 305* (see table 1), and transplanting was done with the *Lannen* semi-automatic transplanter. Several species were studied : the black spruce, white spruce, red spruce, Norway spruce, red pine, white pine and tamarack. A number of cultural practices were adjusted as a result of this experiment. Results fully justified a second experiment.

The *Ecopot* was found to be prohibitively expensive and was replaced by the *Kord,* a semi-rigid and reusable container. Three container sizes (see table 1) were used for six different tree species : black spruce, white spruce, Norway spruce, red pine, white pine and tamarack. Best results were obtained with the *Kord # 200* (see Table 2). Work on the tamarack was discontinued because stem weakening during the second season resulted in serious malformations.

Table 1. Characteristics of containers

Name	Dimensions (cm)	Number of cavities	Density (cav./m^2)	Volume (cm^3/cav.)
Ecopot # 305	40 x 60 x 5	349	1 454	25.5
Kord # 200	28 x 55 x 4	200	1 299	11.0
Kord # 273	30 x 51 x 3	273	1 784	5.0
Kord # 288	28 x 55 x 3	288	1 870	5.5

Table 2. Results obtained from transplanted seedlings produced in mini-cell containers (Grandes-Piles nursery)

Date m - d	Species	Age	Height (cm)	Diameter (mm)	Weight (mg)	Container
06-05	PICma	1.5-0.0	10.0	1.47	220	*Ecopot 305*
06-05	PICgl	1.5-0.0	6.9	1.30	227	*Ecopot 305*
06-05	PICab	1.5-0.5	8.0	1.34	195	*Ecopot 305*
06-05	PICru	1.5-0.0	8.4	1.48	210	*Ecopot 305*
06-11	PINre	1.5-0.0	8.4	1.42	287	*Ecopot 305*
06-11	PINst	1.5-0.0	8.3	1.82	257	*Ecopot 305*
07-28	PICma	0.5-0.0	5.3	0.46	58	*Kord 200*
07-28	PICma	0.5-0.0	3.8	0.38	38	*Kord 273*
07-28	PICma	0.5-0.0	4.7	0.38	42	*Kord 279*
07-28	PICgl	0.5-0.0	4.1	0.46	64	*Kord 200*
07-28	PICgl	0.5-0.0	3.7	0.44	49	*Kord 273*
07-28	PICgl	0.5-0.0	3.5	0.43	46	*Kord 288*
07-28	PICab	0.5-0.0	6.7	0.71	129	*Kord 200*
07-28	PICab	0.5-0.0	4.5	0.65	76	*Kord 273*
07-28	PICab	0.5-0.0	5.1	0.65	93	*Kord 288*
07-28	PINre	0.5-0.0	4.3	0.65	110	*Kord 200*
07-28	PINre	0.5-0.0	3.9	0.64	80	*Kord 273*
07-28	PINre	0.5-0.0	4.1	0.62	85	*Kord 200*
07-28	PINst	0.5-0.0	4.7	0.98	130	*Kord 200*
07-28	PINst	0.5-0.0	4.8	0.87	95	*Kord 273*
07-28	PINst	0.5-0.0	4.4	0.88	117	*Kord 288*
07-28	LAla	0.5-0.0	7.5	0.91	114	*Kord 200*
07-28	LAla	0.5-0.0	7.2	0.99	100	*Kord 288*

Table 3. Fertilization applied to seedlings from mini-cell containers

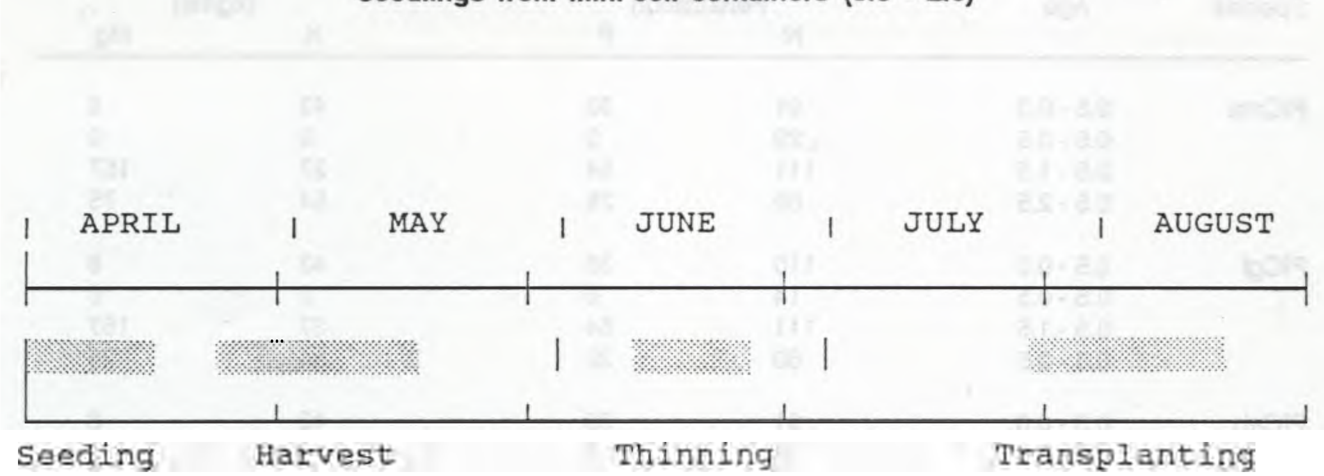
Species	Age	Fertilization N	P	K	(kg/ha) Mg
PICma	0.5 - 0.0	91	30	43	8
	0.5 - 0.5	29	0	0	0
	0.5 - 1.5	111	54	37	157
	0.5 - 2.5	60	25	54	75
PICgl	0.5 - 0.0	110	30	43	8
	0.5 - 0.5	14	0	0	0
	0.5 - 1.5	111	54	37	157
	0.5 - 2.5	60	25	54	75
PICab	0.5 - 0.0	91	30	43	8
	0.5 - 0.5	14	0	0	0
	0.5 - 1.5	111	54	37	157
	0.5 - 2.5	60	25	54	75
PINre	0.5 - 0.0	91	30	43	8
	0.5 - 0.5	29	0	0	0
	0.5 - 1.5	136	54	51	117
	0.5 - 2.5	90	25	54	75

Table 4. Results obtained from deliverable plants (Grandes-Piles nursery)

Species	Age	Height (cm)	Diameter (mm)	Weight (mg)	H/D
PICma*	0.5 - 2.5	42	6.8	15 755	6.3
PICma	2.0 - 2.0	34	6.4	11 826	5.5
PICgl*	0.5 - 2.5	34	7.0	11 851	5.0
PICgl	2.0 - 2.0	31	5.9	9 961	5.4
PICab*	0.5 - 2.5	36	6.4	13 086	5.7
PICab	1.0 - 3.0	37	5.6	12 752	6.8
PINre*	0.5 - 2.5	27	5.6	11 007	4.9
PINst*	1.5 - 2.5	33	8.2	-----	4.0
PInst	2.0 - 2.0	25	5.5	9 597	4.7

* Transplant seedlings produced in mini-cell containers

Figure 1. Distribution of operations respecting transplant seedlings from mini-cell containers (0.5 - 2.5)



Operational scale production

Since 1989, the Grandes-Piles nursery has seeded all bareroot production (except tamarack) in mini-cell containers. This practice has a number of advantages.

Germination is improved in a peaty soil, and tunnel seeding provides protection against birds and spring freezing.

The seedlings for transplant are extremely uniform because they have grown in the same soil type with the same level of fertility. As well, there is no transplant shock. Seedlings are transplanted along with substratum almost as soon as they are extracted. Quality of the transplant is much improved. Depth and verticality are more easily adjusted and there are no hockey stick roots.

Weed control is also made easier. There are virtually no weeds in the containerized phase. During this period, transplant beds can be treated with non-selective herbicides. A thick layer of green manuring can also have excellent results. Finally, the transplanted seedlings rapidly take over the floor of the site in the final year.

Fertilization can be more effectively controlled in mini-cell containers. Fertilizers can be applied during the containerized phase, before transplanting, so that nutrients are situated near the plants. (see table 3 for a summary of fertilizer applications).

Finally, the quality of deliverable plants is significantly higher (see table 4). The plants reach minimum height much more easily and diameter increases. There are more rootlets but no hockey stick roots.

In some of cases, production in mini-cells makes it possible to reduce turnover time : plants can be produced in 0.5 - 2.5 as opposed to 2.0 - 2.0. As well, operations are more efficiently distributed over the season. Seeding and transplanting do not have to be done during the harvest period (see figure 1).

The method nonetheless requires investment in infrastructures such as tunnels, containers, handling systems, etc. Without high quality seeds and a precision seed drill, thinning remains necessary to conserve one plant per cavity. More attention must be paid to irrigation, since the soil quickly becomes dry.

Future development

The possibilities for future development are both numerous and encouraging. The need for thinning can be eliminated through the use of precision seed drills and high quality seeds. Further improvement can be achieved by using cuttings or pre-germinated seeds.

The form of the root system could be improved by making containers of the right size and shape. This would facilitate air pruning at different levels in order to maintain horizontal roots. Similar results might be obtained through chemical pruning. A binding agent might be used to firm up the increment core and enable transplanting before roots are too straight.

Finally, yield and quality could be increased by mechanizing the operation.

Conclusion

Although the approach is gradually gaining popularity in Quebec, production in mini-cells is still in its beginning stages. Improvements are made every year as new information becomes available. Research is being carried out on cultural techniques, and results so far look extremely encouraging.

References

BERGERON, C. 1989. *lnventaire annuel des plants 1989.* Pepiniere de Grandes-Piles, Quebec. 131 p.

GELINAS, D. 1989. *La regie nutritionnelle des productions en recipients, saison 1989.* Pepiniere de Grandes-Piles, Quebec. 31 p.

GELINAS, D. 1989. *La regie nutritionnelle des productions a racines nues, saison 1989.* Pepiniere de Grandes-Piles, Quebec. 64 p.

GOULET, S. 1988. *Regie nutritionnelle des productions a racines nues, 1988.* Pepiniere de Grandes-Piles, Quebec. 260 p.