

UTILIZATION OF JIFFY PELLETS IN THE PRODUCTION OF PINE AND EUCALYPT SEEDLINGS, PINE ROOTED CUTTINGS AND NATIVE SPECIES PROPAGATION: NURSERY AND FIELD COMPARISONS¹

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ABSTRACT—Smurfit Carton de Colombia began trials with Jiffy pellets in 1993. A number of pine and eucalypt species have been tested for seedling and clonal production. Field trials comparing root form and tree growth at one year of age show no height differences in seedlings grown in Jiffy pellets compared to those produced in containers. An advantage of the Jiffy pellets is reduced time in the nursery. Also there are further advantages to the Jiffy system since no further substrate needs to be obtained and this reduces labor costs in the nursery, Jiffy pellets are less costly to transport and are faster to plant when compared to seedlings in other container systems. Currently Smurfit Carton de Colombia is using Jiffy pellets on an operational basis for pine cuttings, eucalypt seedlings, pine seedlings and native tree species propagation.

INTRODUCTION

The two nurseries of Smurfit Carton de Colombia (SCC) have an annual capacity of twelve million plants. The species utilized include native and exotic species produced mainly for planting on land owned by the Company. In recent years much effort has been made to contract grow seedlings for other groups and to donate seedlings to certain government and non-governmental organizations. The systems presently used in the nurseries include bare root, plastic containers (tray) and plastic bag. Each system functions for certain species and has attached costs and benefits. Over the last 30 years, nursery systems have been matched to species, fertilizer regime, mycorrhizae inoculation, irrigation system, seed and clonal propagation. As such the nursery manager is constantly evaluating methods to produce the required quality of plants in less time and at less cost. It is in this regard that Jiffy pellets were begun on a trial basis in 1993. Jiffy Products Ltd. was formed in Norway in the early 1950's to service the agriculture and horticulture industries in Europe and North America. The original products were peat pots. The Jiffy peat pellet was introduced in 1972 and provides both media and container in individual pellet form. The compressed peat is encapsulated in a biodegradable net. The Jiffy pellet is produced in New Brunswick, Canada where the Company has access to *Sphagnum* spp. peat. Worldwide the Company produces more than one billion peat pots and pellets and of this total one hundred million forestry pellets were produced and sold in 1996.

The Jiffy pellet has been utilized on a commercial scale in Europe, Canada (Henderson and others 1994), Colombia, Uruguay, Chile and Indonesia. The compressed, ready to use, pathogen-free and consistent forestry pellet system is easily transported in boxes. Once the pellet is placed on the ground or on a suitable platform, water is added, the compressed pellet (1 cm in height) expands to seven cm in height and a seed or cutting can be placed in the pre-formed cavity to provide an instant forest nursery.

Tree seedling root growth and development has been reported to be superior in Jiffy pellets (Balisky and others, 1995) and this was observed in the first trials conducted with the pellets at the SCC nursery. The objectives of the study were to evaluate nursery efficiencies and field growth of Jiffy pellets compared to normal nursery systems for pine and eucalypt seedlings and cuttings.

NURSERY AND FIELD TRIALS—ESTABLISHMENT

Jiffy Products Ltd. provided sufficient pellets for the nursery and field trials which were initiated in 1993. The traditional system consists of a plastic tray with a substrate of 50 percent sifted coal ash and 50 percent subsoil providing both an inert and a locally available product. The pellets and traditional systems were planted on the same day for a given species. This resulted in the Jiffy pellets being ready much earlier for trial planting than seedlings or cuttings produced in the traditional system. All seedlings and cuttings were planted on the same day in the field trials and it is likely that the Jiffy pellet material was planted later than would ideally be the standard.

Nursery management was slightly different for pellet and container grown seedlings and cuttings. Due to the smaller size of the pellet less total fertilizer was applied, though mycorrhizae inoculation was the same between the two systems. The irrigation required for the Jiffy pellets was less than for container grown material due to greater water retention in the peat pellet. This implies that consideration to change a nursery to the Jiffy pellet system must be consistent with irrigation source and method of application.

Comparison of seedlings and cuttings produced in Jiffy pellets and the standard plastic tray were undertaken starting in 1995 in the nursery and in field plantings. The nursery evaluation was on the form and quantity of roots. Field evaluation was undertaken by establishing two replicated trials of single tree plot design to determine any differences in survival and growth due to the nursery production method.

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Table 1-Root collar diameter (RCD) in mm and height (HT) in cm for pine seedlings grown in Jiffy pellets or plastic containers

Type	<i>P. patula</i>		<i>I? tecunumanii</i>		<i>P. maximinoi</i>	
	RCD	HT	RCD	HT	RCD	HT
	m	m	June 6, 1996			
Jiffy 28mm	3.9	11.1	4.7	23.2	4.2	19.0
Jiffy 30mm	3.8	11.9	4.0	20.0	3.8	16.3
Jiffy 36mm	4.0	13.5	4.5	25.1	4.2	19.3
Container	2.6	5.3	3.0	10.2	3.6	13.8
			October 23, 1996			
Jiffy 28mm	9.1	37.1	12.2	61.8	10.4	47.3
Jiffy 30mm	9.4	39.9	10.9	59.4	10.8	45.3
Jiffy 36mm	9.5	41.6	13.4	66.0	10.3	46.8
Container	6.8	30.3	11.3	59.6	9.6	40.7

Table 2-Root form evaluation for seedlings of *E. grandis* and *P. kesiya* and clones of *E. grandis* grown in Jiffy pellets or plastic containers

Type	<i>P. kesiya</i>	Seedling	MES0103	SUI2401	SUI4610
		<i>E. grandis</i>			
Jiffy 18mm	---	44.6	50.9	20.8	24.3
Jiffy 24mm	69.5	72.0	54.1	83.1	62.5
Jiffy 28mm	89.0	104.7	58.2	70.0	98.6
Jiffy 30mm	116.8	94.6	75.9	56.7	109.3
Jiffy 36mm	97.6	101.7	76.4	53.5	120.4
Container	93.4	92.9	134.3	186.4	119.3

NURSERY AND FIELD TRIAL-RESULTS

Root development in Jiffy pellets was generally superior to that of the standard nursery system. For pine cuttings from three species (*patula*, *maximinoi* and *tecunumanii*) the Jiffy pellets were superior for root collar diameter and total plant height (tables 1 and 3). However, for cuttings of *Eucalyptus grandis* the standard nursery container produced superior quality roots mainly because the Jiffy pellets were kept too humid in that first trial (table 2). Subsequent results have given better performance of Jiffy pellets with eucalypt cuttings. Root form scores for seedlings of *Pinus kesiya* and *Eucalyptus grandis* were also superior when produced in Jiffy pellets (table 2).

Survival of both nursery types was above 95 percent in the field trials. Height growth data at one year of age is presented in table 4. The Jiffy pellet-produced seedlings and clones were mostly equal to or taller than the standard nursery production system. In certain of the eucalypt clones the standard nursery system produced taller trees and this was again due to high humidity in the pellets during initial root formation, a problem corrected in subsequent use.

OPERATIONAL USE OF JIFFY PELLETS

Following acceptable root development along with adequate field growth a decision was taken in 1996 to increase the usage of Jiffy pellets. Trial results were also utilized to determine the appropriate Jiffy pellet size to

maximize cost benefits of the Jiffy system. Since that time 100 percent of the pine cuttings have been produced in Jiffy pellets. This has resulted in an increase of 33 percent in rooting percentage and a 30 percent decrease in the length of time required for nursery production. Production of pine and eucalypt seedlings in Jiffy pellets will reach three million in 1998. Native tree species produced in Jiffy pellets include *Cordia alliodora*, *Alnus acuminata*, *Podocarpus* sp., *Quercus* sp. and others.

Use of Jiffy pellets has resulted in significant cost savings. Nursery space is reduced for Jiffy pellet production thus decreasing costs of water, fertilizer, pesticides and labor. Transport of the pellet-produced seedlings to the planting site has less than half the cost of transporting the standard nursery container. Planting productivity has increased since the Jiffy pellet material is smaller than conventional nursery production.

CONCLUSIONS

Significant cost reductions have taken place through the use of Jiffy pellets to produce pine and eucalypt seedlings and cuttings. Root form and initial height growth are as good as or better for Jiffy pellet produced material compared to standard nursery containers. Continued research and development of the Jiffy pellet system are likely to lead to future cost savings while resulting in superior root quality and growth of planted trees.

Table 3—Root form evaluation for rooted pine cuttings grown in Jiffy pellets or plastic containers

Type	<i>P. patula</i>	<i>t? tecunumanii</i>	<i>t? maximinoi</i>
Jiffy 28mm	58.0	47.0	71.0
Jiffy 30mm	74.3	28.2	63.2
Jiffy 36mm	61.6	68.8	50.9
Container	24.3	31.3	33.5

Table 4—First year height growth on two sites for seedlings and clones of *E. grandis* grown in Jiffy pellets or containers

LaSuiza						
Type	<i>I? kesiya</i>	Seedling	<i>E. grandis</i>			
			MES01 03	SUI2401	SUI4610	
Jiffy 18mm	—	4.3	3.3	4.5	4.5	
Jiffy 24mm	1.2	4.2	3.5	5.3	5.1	
Jiffy 28mm	1.1	4.0	3.8	5.0	5.1	
Jiffy 30mm	1.2	4.4	3.5	4.9	4.8	
Jiffy 36mm	1.2	4.6	3.7	4.8	4.9	
Container	1.2	4.5	3.7	4.5	4.8	

Emiliana						
Type	Seedling	<i>E. grandis</i>				
		MES01 03	SUI2401	SUI4610		
Jiffy 18mm	3.7	3.5	3.7	3.6		
Jiffy 24mm	3.9	4.1	4.7	4.3		
Jiffy 28mm	4.8	4.1	3.0	4.0		
Jiffy 30mm	4.7	3.7	3.4	3.8		
Jiffy 36mm	4.8	3.8	3.2	4.1		
Container	4.8	4.7	5.3	4.6		

Efforts began in the southern US in 1996 to begin the use of Jiffy pellets in forestry nurseries. Amongst the possible uses are for production of **longleaf** pine, hardwood seedlings and cuttings, pine cuttings and Christmas trees. Research is underway at universities, private companies as well as state owned nurseries.

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