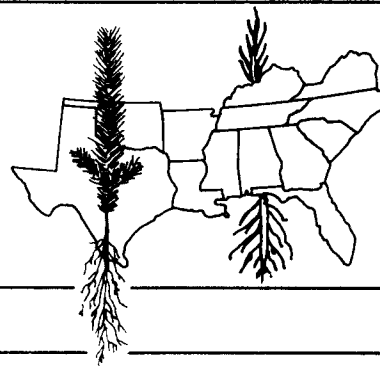


auburn university southern forest nursery management cooperative



RESEARCH REPORT 97-4

The Use of Polyethylene Seedling Storage Bags and their Impact on Bag CO₂ Levels and Outplanting Survival.

by
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INTRODUCTION

Many nursery managers use polyethylene lined kraft paper bags to store seedlings after lifting. Although these bags have become the standard storage container for many nurseries, there has been a problem of supply during the last two years. Availability of kraft bags has declined while price has increased. Polyethylene bags (essentially an extruded plastic) has been proposed as a possible substitute for kraft bags. These bags are the same size as the standard kraft bag and may be made of varying thicknesses. We decided to test the suitability of these bags for seedling storage. We were particularly interested in determining if the pure polyethylene bags would accumulate CO₂, and if so would this affect outplanting survival.

METHODOLOGY

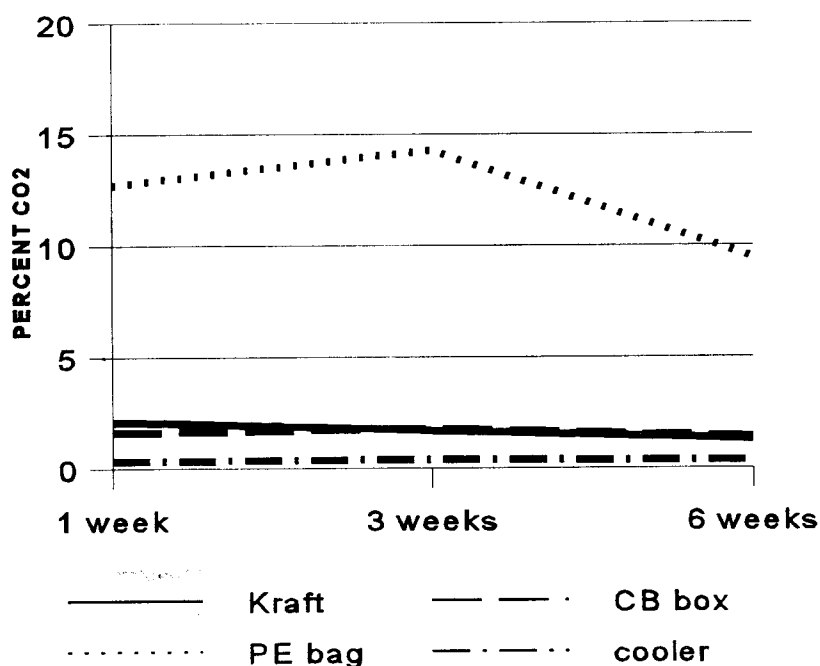
We decided to compare the polyethylene (PE) bag (5 mil thickness) to the standard kraft paper (KP) bag as well as cardboard (CB) boxes. We set the experiment up at three different nurseries. The experiment was initiated on February 3 by going to each nursery and filling 3 PE bags, 3 KP bags, and 3 CB boxes with 800 to 1000 loblolly pine seedlings. These nine seedling containers were placed in the cold storage facility at each of the three nurseries. At 1, 3, and 6 weeks of storage in the cooler, the CO₂ level in each container was measured using a Kitigawa gas detection tube system. Also, 4 different samples of 25 seedlings (hereafter called replications) was taken from a PE, KP, and CB container at the same time. These seedlings were outplanted the next day. The field design was a split split plot with 4 replications, 3 nurseries (whole plot), 3 bag types (subplot), and 3 times (sub subplot) planted at one site near Auburn, Alabama. Planting date is therefore confounded with storage time. The total number of trees planted was 900. A survival count was made during the first week in May, or 6 weeks after the last planting date.

RESULTS

CO₂ Accumulation in the Containers

Figure 1 presents the results of CO₂ measurements made after 1, 3, and 6 weeks of storage. It is evident that the PE bags accumulate CO₂ at higher levels than either the KP or CB containers. Statistical analysis indicated that the PE bags had significantly higher levels of CO₂ inside the bag than either the KP bag or the CB box. The average ambient CO₂ level in the coolers during this period was stable at about 0.34% (3,400 ppm). Normal atmospheric CO₂ is at 320 ppm.

Figure 1. Percent CO₂ in seedling containers at 1, 3, and 6 weeks of storage.



It is also evident from these results that CO₂ concentrations in seedling containers rise to relatively high levels very quickly, probably within a few days. The CO₂ levels in all treatments were stable after only 1 week in storage.

Outplanting Survival

Table 1 presents the % survival by nursery, container type, and storage time. Survival was generally high with treatment averages 90% or above. There was no significant difference between container types for survival. Even though the polyethylene bag had significantly higher levels of CO₂, there was no effect on survival. There were significant effects on survival by both nursery and storage time, although in both cases the differences were small. The 6 week storage time had significantly lower survival than did the 1 and 3 week storage. Even so, this was due to a lower planting survival for seedlings stored in boxes for 6 weeks at only a single nursery (Nursery C).

Table 1. Average percent survival in early May for main variables (each number represents 300 seedlings). *

<u>Nursery</u>		<u>Container</u>		<u>Storage</u>	
A	99% a	kraft	97% a	1 week	99% a
B	96 a b	PE	96 a	3 weeks	99 a
C	93 b	CB	95 a	6 weeks	90 b

* Seedlings followed by the same letter were not significantly different ($\alpha=.05$) using Duncan's Multiple Range Test.

MANAGEMENT IMPLICATIONS

There is no detrimental effect of using polyethylene bags to store seedlings. High CO₂ levels apparently does not harm seedlings, at least not at the levels produced by seedlings themselves stored in a completely closed system. Both cardboard boxes and standard kraft bags were equally suitable for seedling storage. Even so, it should be noted that at one particular nursery, seedlings stored in boxes for 6 weeks did not survive as well as those stored in bags.

Although the poly bags had no adverse effect on seedling quality, they do have other problems. (1) they will not stand up (2) they often busted during the strapping process, and (3) they seemed to puncture easier. Nevertheless, they can be used as a substitute for kraft bags should be necessity present itself.