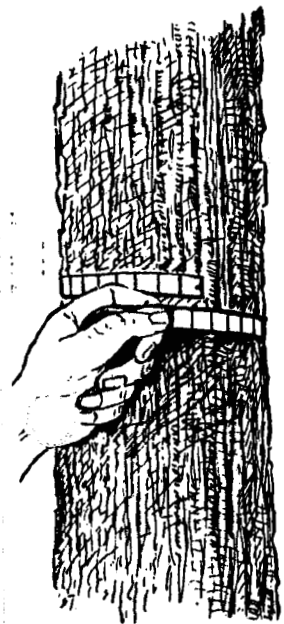
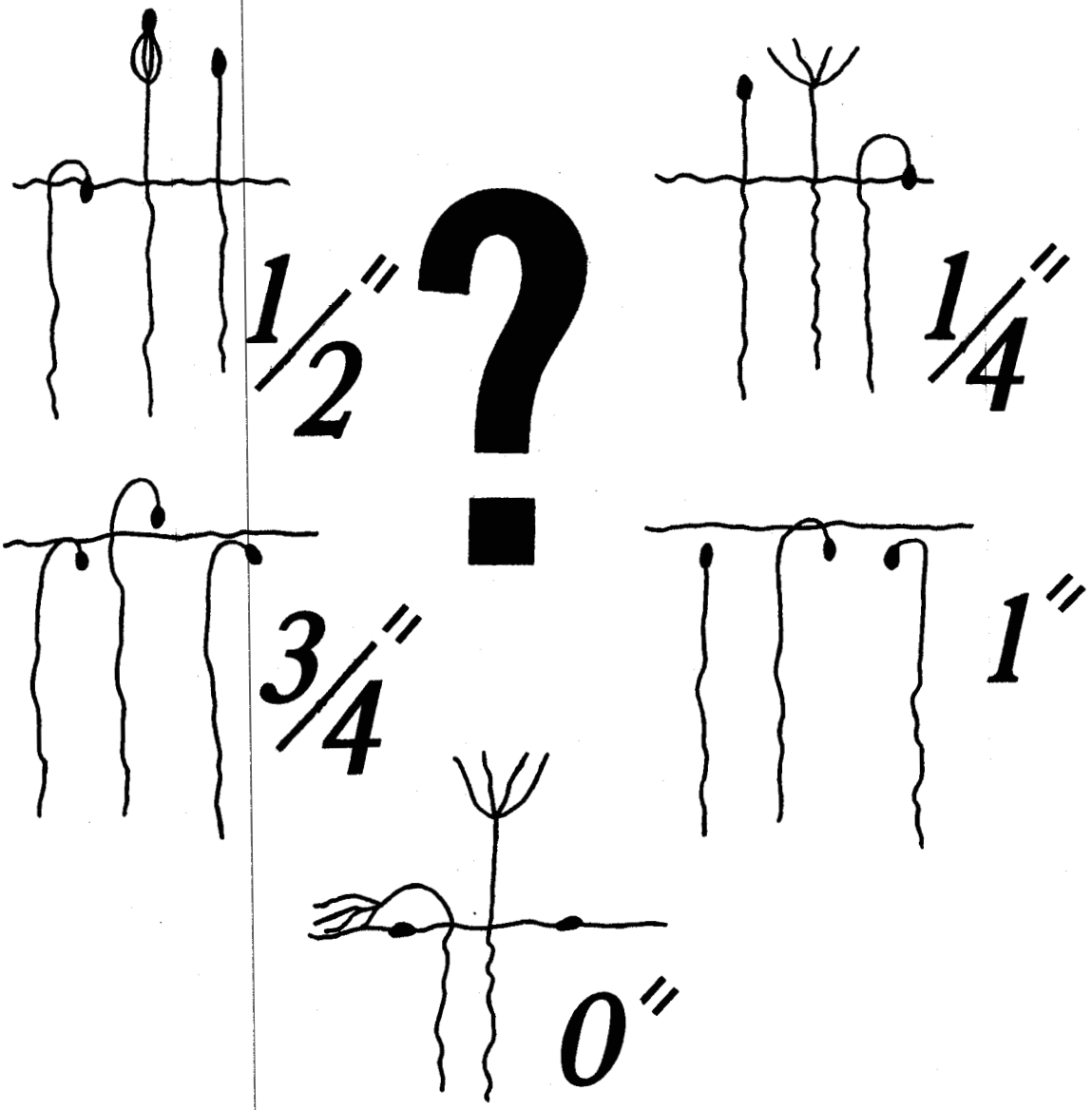


Occasional Report 73 November 1988

A TWO-YEAR STUDY COMPARING FIVE SOWING DEPTHS FOR LOBLOLLY PINE SEED



Virginia
Department of Forestry

A TWO-YEAR STUDY COMPARING FIVE SOWING DEPTHS FOR LOBLOLLY PINE SEED

By: Thomas A. Dierauf and Laurie J. Apgar

ABSTRACT

Loblolly pine seed sown at a depth of 1/4 to 3/4 inches germinated and survived better than that sown on the soil surface or at a depth of one inch. Survival for loblolly seed at depths of 1/4 to 3/4 inches was 68.5 to 77.2 percent after 58 days in 1984 and 80.2 to 84.8 percent after 34 days in 1985. In comparison, survival for loblolly seed on the surface and at a depth of one inch was 33.2 and 47.8 percent respectively in 1984 and 14.2 and 71.0 percent respectively in 1985. Speed of germination was inversely correlated with depth of sowing; seed sown deeper germinated more slowly.

INTRODUCTION

The depth at which seed is sown in the nursery can be controlled by nursery personnel, and is a factor which affects subsequent stocking and seedling growth. The optimal depth is just deep enough for good anchorage and protection of the radicle from extreme heat and desiccation. Provided that these requirements are met, the more quickly the seedling can emerge, the better survival and growth will be. When seed is sown too deeply, seedlings will expend more energy in emerging from the soil and will consequently be weaker.

This study compared five depths of sowing (0, 1/4, 1/2, 3/4, and 1 inch) for loblolly pine seed during two consecutive spring sowing seasons. The study was conducted at the New Kent nursery in the coastal plain of Virginia.

PROCEDURES

The soils at the New Kent nursery are excessively well drained sands to loamy sands, with sand content averaging around 90 percent. Because the soil was loose and dry when the studies were installed, the seed was sown in furrows made by hand to within 1/16 to 1/8 inches of the desired depth. The study was installed on May 1 in 1984 and on April 25 in 1985.

Both studies were composed of four replications, located in different seedbeds, widely scattered around the nursery. Each replication included five adjacent plots, with the five sowing depths randomly assigned. In the center of each plot, four one-foot long furrows were made at the desired depth, each receiving 25 carefully spaced seed. The seed for the 0-inch treatment was pressed into the soil surface and the other treatments were covered with soil to the appropriate depth. All treatments were watered by hand following seeding to simulate normal operational irrigation.

The 1984 study experienced severe winds just three days after sowing. Both the 0 and 1/4-inch treatments showed exposed or scattered seed, which was replaced as well as possible. The depths of soil over the other treatments could also have been changed.

Germination was tallied periodically, including a cumulative tally of mortality. In 1984, tallies continued until 58 days after sowing, although little significant change occurred in the last several weeks. In 1985, tallies were only continued until 34 days after sowing, when germination was essentially complete. The heights of the surviving loblolly seedlings were measured prior to lifting, in 1984 only.

RESULTS AND DISCUSSION

Survival percents in 1984 and 1985 were highest for the 1/2 and 1/4-inch sowing depths, with the 3/4-inch depth only slightly lower (Table 1 and Figures 1 and 2). The other depths, 0 and 1 inch, were significantly different both from the two best depths and from each other. The surface sowing was by far the poorest in both studies. An analysis of variance on arc sine percent survivals revealed significant differences among treatments (in 1984, $p = .00003$ and, in 1985, $p = .000000009$). Survival percents in Table 1 not followed by the same letter are different at the .05 level, using Duncan's New Multiple Range Test.

Table 1. Percent survival and mortality for 1984 and 1985 depth of sowing studies, average of 4 replications.

	1984 (after 58 days)			1985 (after 34 days)		
Depth (inches)	Survival	Mortality	Total	Survival	Mortality	Total
0	33.2c	14.5	47.8	14.2c	16.0	30.2
1/4	74.5a	4.5	79.0	83.8a	3.0	86.8
1/2	77.2a	2.5	79.8	84.8a	3.5	88.2
3/4	68.5a	6.5	75.0	80.2ab	5.8	86.0
1	47.8b	8.8	56.5	71.0b	8.5	79.5

Figure 1. Survival of 1984 depth of sowing study.

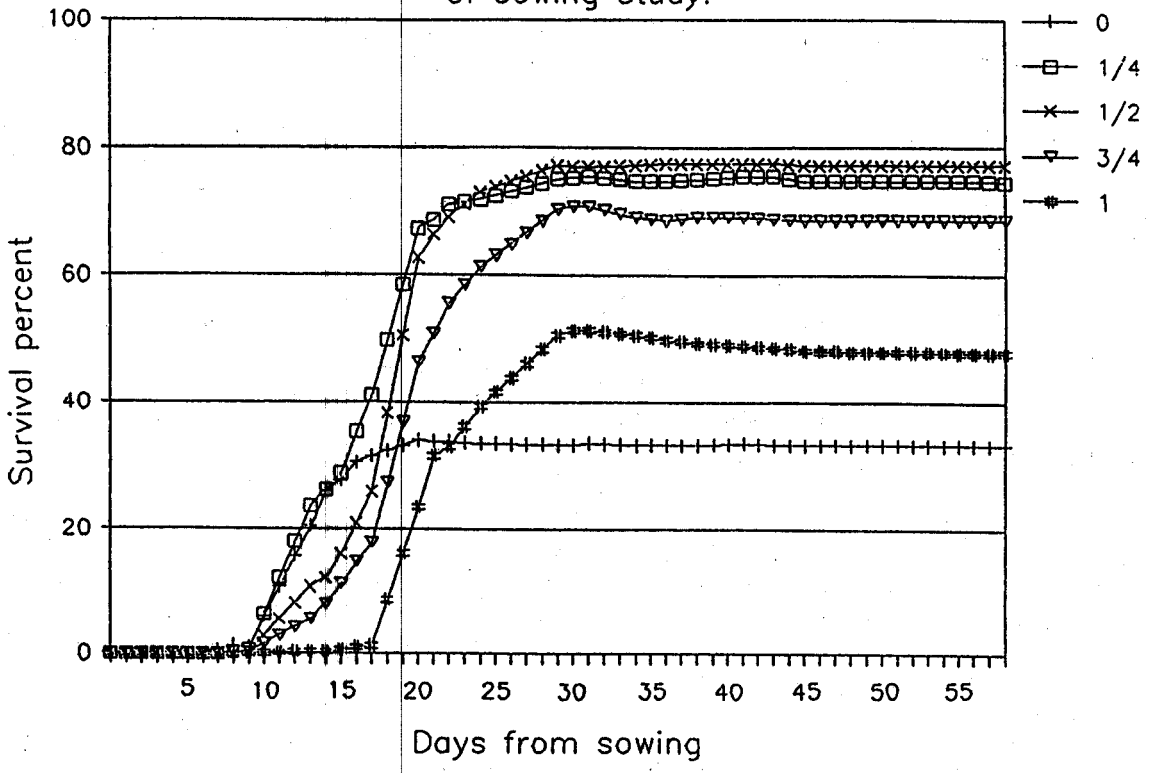
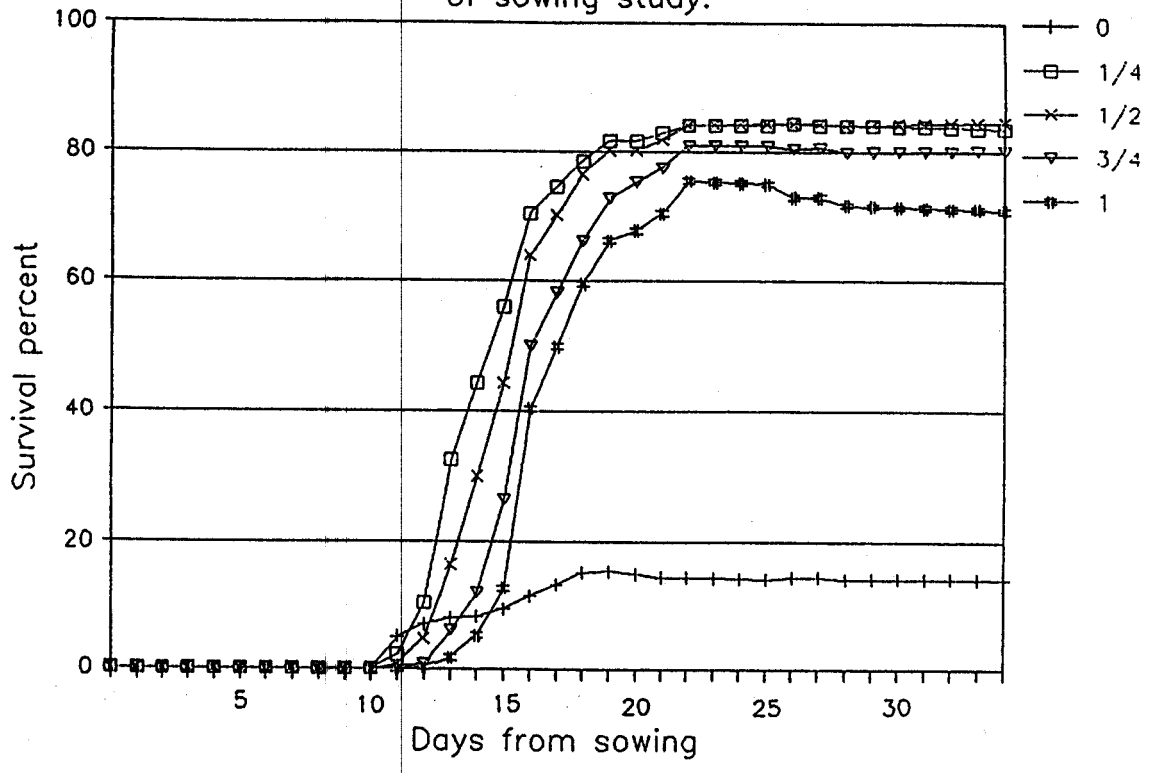


Figure 2. Survival of 1985 depth of sowing study.



Overall germination for the loblolly seedlots used in the two studies ranged from 75 to 88 percent at the optimal depths (1/4 to 3/4 inches).1/ Therefore, the seed was of at least average viability. In 1984, the 1-inch depth did not germinate this well, reflecting a general weakness associated with deep sowing. Seedlings from this depth were also the shortest at the time of lifting. A deeply-sown seedling expends more of its initial reserves simply reaching the soil surface, and needles are often twisted and chlorotic by the time of emergence.

The 0-inch depth definitely exhibited the lowest total germination, although this figure is probably underestimated. Many times, a seed on the surface will produce a radicle which fails to make contact with the soil. This radicle will often shrivel up from heat and lack of moisture and will have disappeared by the next count.

Total germination and survival are plotted for each depth in each year in Figures 3 through 12. These graphs show that speed of germination is inversely correlated with depth of sowing. Percent mortality also relates to depth of sowing. The surface sowing experienced mortality of at least 14.5 percent in 1984 and 16.0 percent in 1985. Mortality was lowest at the 1/4 and 1/2-inch depths and increased at the 3/4 and 1-inch depths.

In conclusion, germination, survival, and subsequent stocking of loblolly seedlings on the sandy soils of Virginia's coastal plain would be improved by sowing at depths of 1/4 to 1/2 inches. In general, remembering that the seed pressed into the soil surface fared the worst, aiming for a slightly deeper depth would be the safest procedure.

1/ In both years, the seedlot used was a mixture of 2/3 seed orchard and 1/3 commercial seed.

Figure 3. Total germination and survival for 0-inch depth, 1984 study.

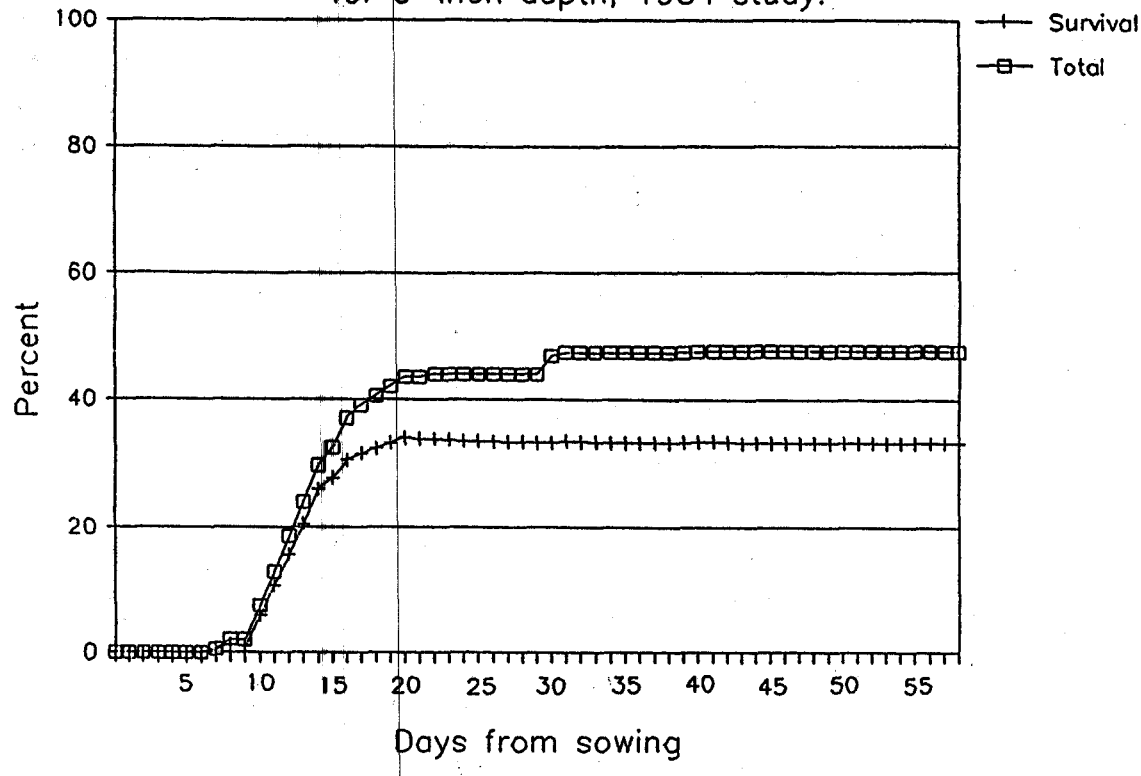


Figure 4. Total germination and survival for 1/4-inch depth, 1984 study.

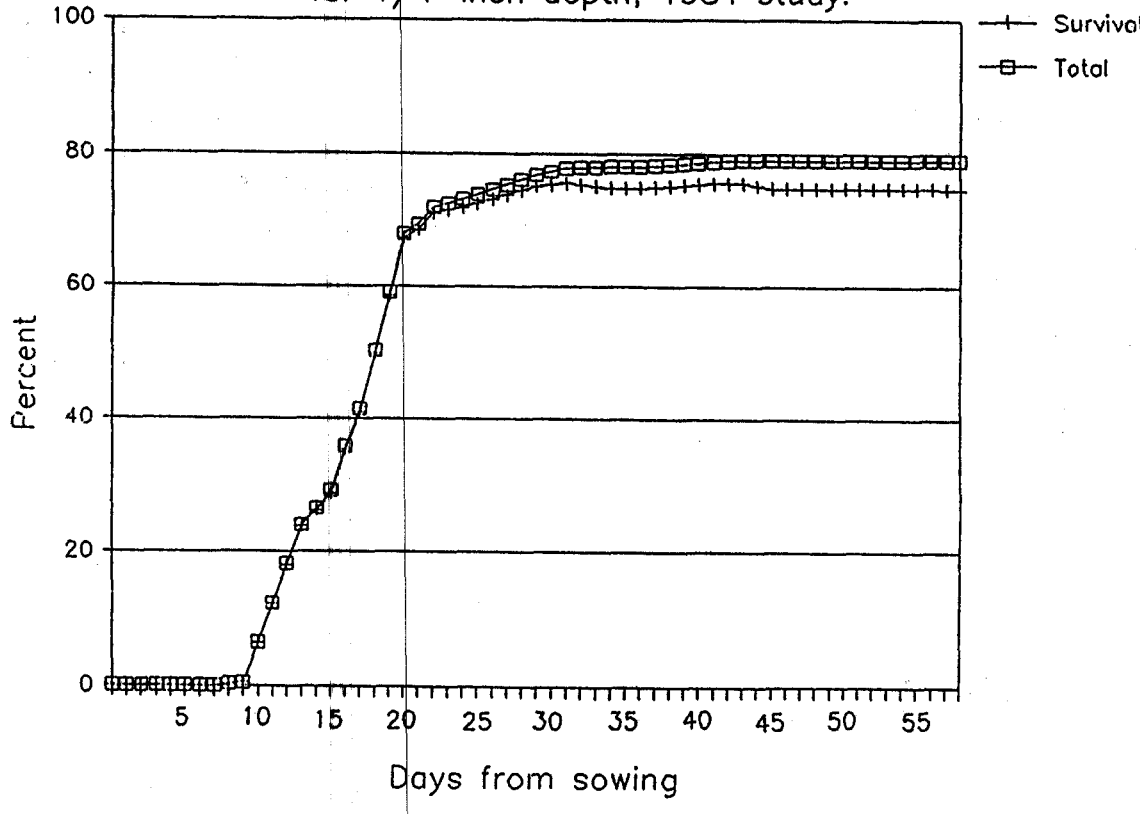


Figure 5. Total germination and survival for 1/2-inch depth, 1984 study.

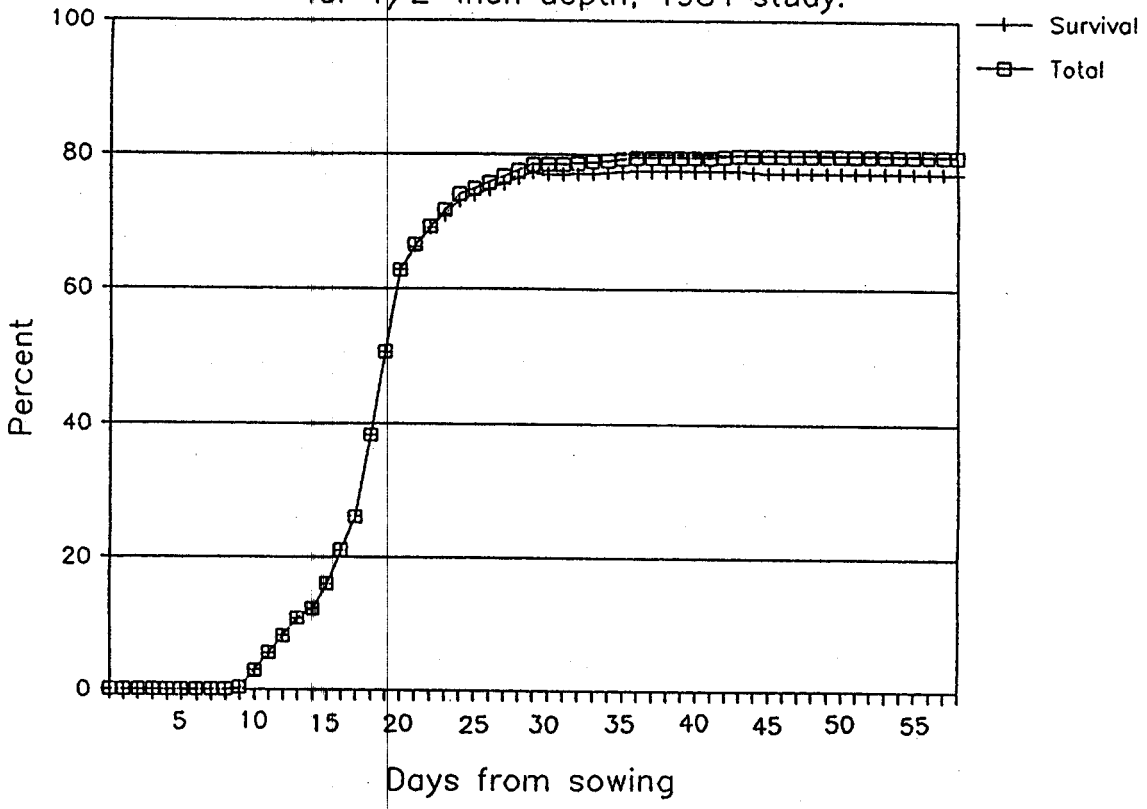


Figure 6. Total germination and survival for 3/4-inch depth, 1984 study.

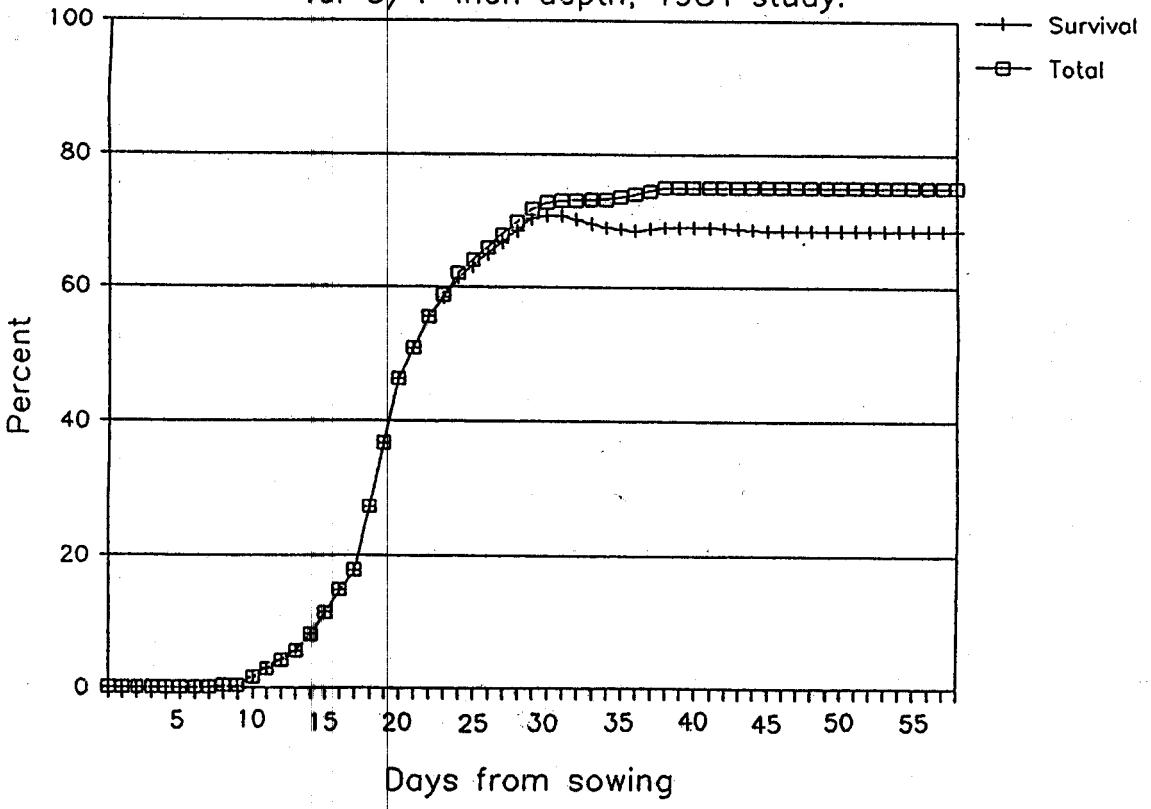


Figure 7. Total germination and survival for 1-inch depth, 1984 study.

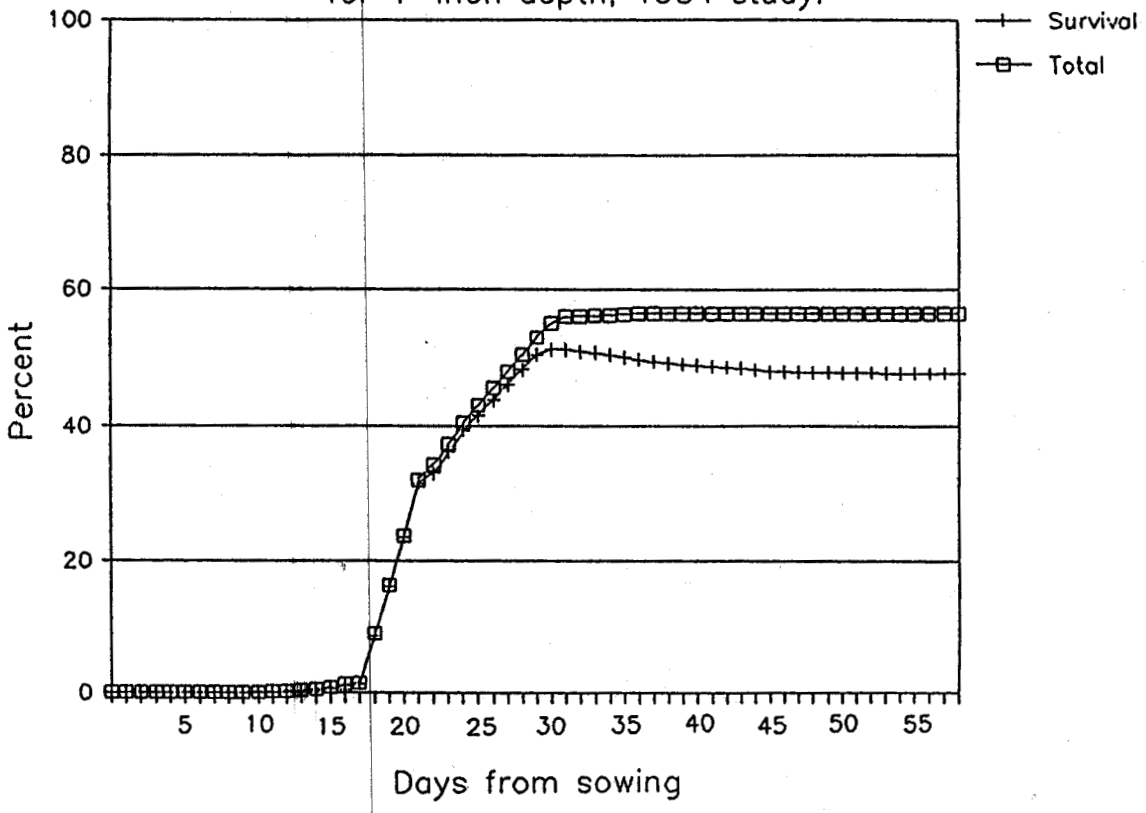


Figure 8. Total germination and survival for 0-inch depth, 1985 study.

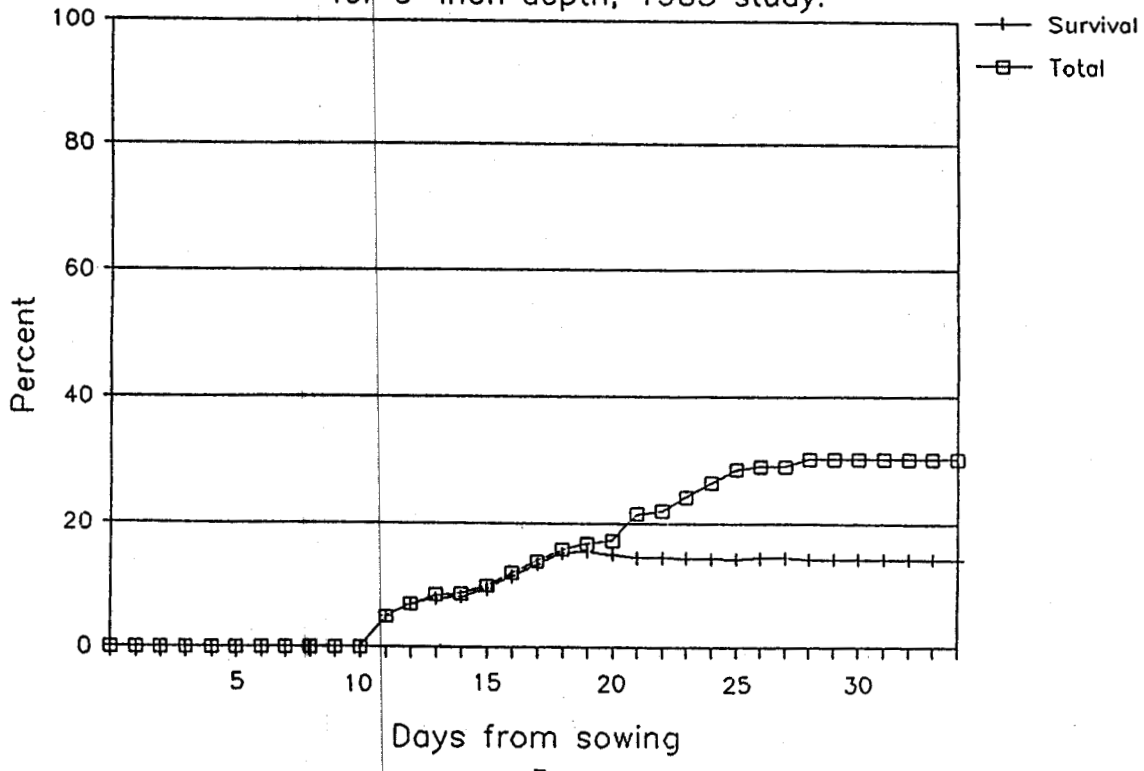


Figure 9. Total germination and survival for 1/4-inch depth, 1985 study.

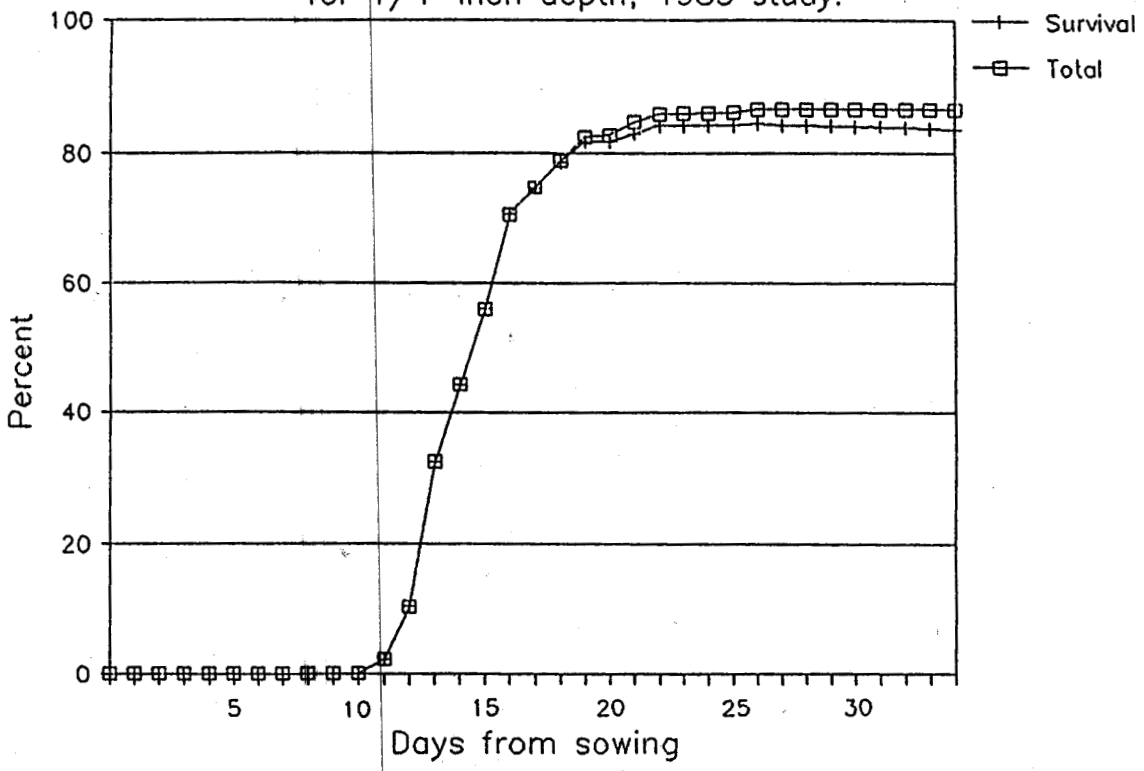


Figure 10. Total germination and survival for 1/2-inch depth, 1985 study.

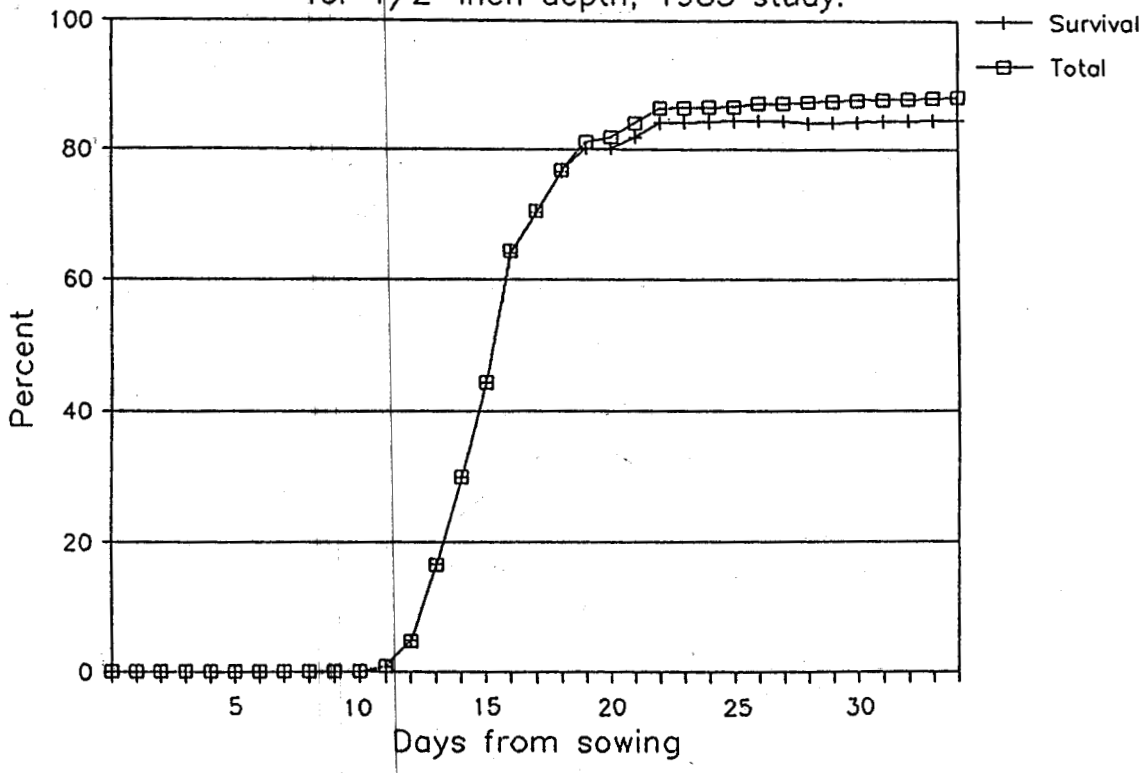


Figure 11. Total germination and survival for 3/4-inch depth, 1985 study.

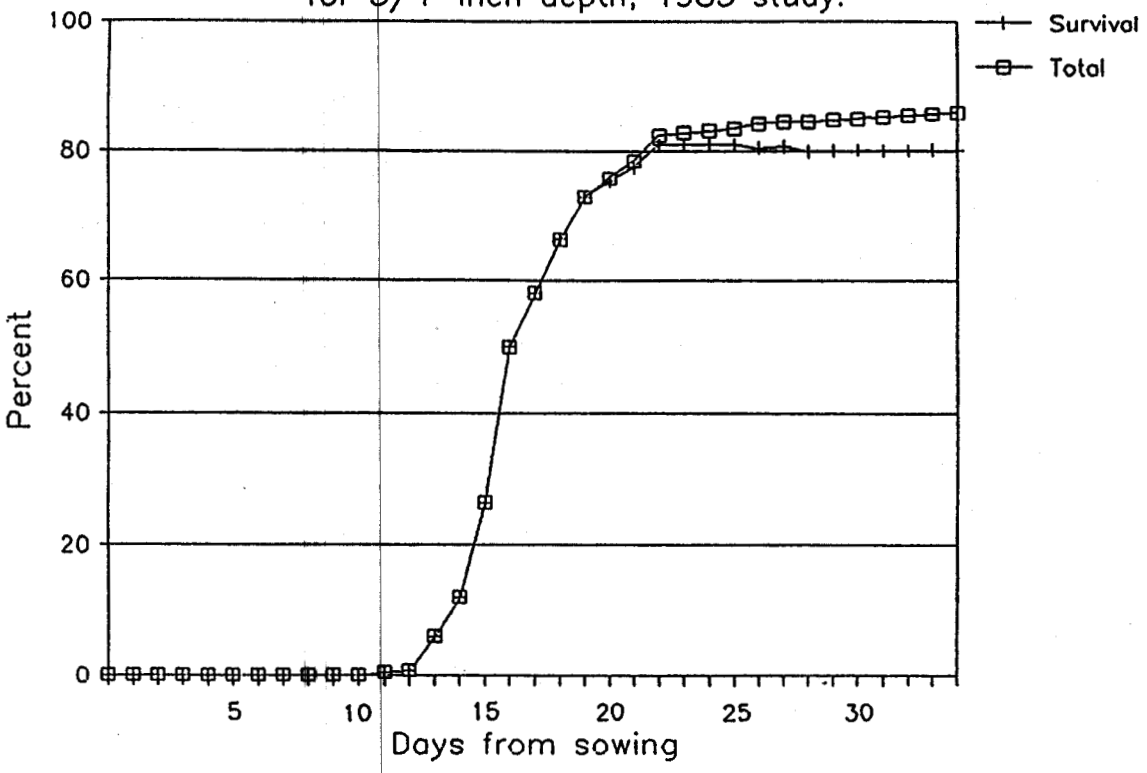


Figure 12. Total germination and survival for 1-inch depth, 1985 study.