

SOME CHARACTERISTICS OF NEWLY GERMINATED SEEDLINGS OF FOUR MAJOR SOUTHERN PINES

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Newly germinated seedlings of slash, loblolly, and Virginia pines cannot be identified from characteristics of their cotyledons and hypocotyls. Shortleaf can be identified because it usually has shorter hypocotyls and fewer and shorter cotyledons than the other species.

Table 1.—Some characteristics of newly germinated seedlings of four major southern pines

Species	Item	Seed lot					All
		1	2	3	4	5	
Slash	Number of cotyledons	5-8(6.6) ¹	5-10(7.8)	6-8(7.2)	6-11(7.8)	5-9(6.9)	5-11(7.2) ²
	Avg. length of cotyledons-cm	3.0-3.9(3.3)	2.4-4.3(3.3)	2.7-4.0(3.2)	2.2-3.2(2.7)	2.2-2.8(2.5)	3.0
	Length of hypocotyl-cm	3.5-4.9(4.2)	3.3-5.1(3.9)	3.3-5.2(4.1)	3.0-4.2(3.5)	2.2-4.1(3.0)	3.7
	Diameter of hypocotyl-cm	0.07	0.10	0.10	0.10	0.10	0.09
Loblolly	Number of cotyledons	6-9(7.1)	5-8(6.6)	6-9(6.9)	6-9(7.5)	6-9(7.8)	5-9(7.2) ²
	Avg. length of cotyledons-cm	1.3-3.2(2.3)	2.1-2.9(2.4)	2.4-4.0(3.2)	1.7-3.7(3.3)	2.1-3.7(3.0)	2.8
	Length of hypocotyl-cm	2.0-4.0(3.2)	3.3-4.0(3.8)	3.3-5.2(4.0)	2.8-5.0(4.4)	2.4-5.8(3.9)	3.9
	Diameter of hypocotyl-cm	0.08	0.06	0.06	0.10	0.10	0.08
Shortleaf	Number of cotyledons	3-7(5.9)	5-8(6.6)	4-8(5.9)	4-8(5.9)	4-7(5.5)	3-8(6.0) ²
	Avg. length of cotyledons-cm	1.3-2.5(1.9)	1.4-2.0(1.8)	1.6-2.6(2.0)	1.3-2.3(1.8)	1.4-2.3(1.8)	1.9
	Length of hypocotyl-cm	1.5-2.4(2.0)	1.6-2.8(2.2)	1.8-2.5(2.2)	1.7-2.5(2.1)	1.8-2.5(2.1)	2.1
	Diameter of hypocotyl-cm	0.08	0.06	0.06	0.08	0.05	0.07
Virginia	Number of cotyledons	5-7(6.3)	6-9(7.1)	5-8(6.5)	6-9(7.9)	6-9(7.4)	5-9(7.0) ²
	Avg. length of cotyledons-cm	1.3-2.9(1.8)	1.6-3.5(2.9)	2.4-3.6(2.9)	1.3-3.6(2.2)	2.1-3.9(2.9)	2.5
	Length of hypocotyl-cm	2.5-4.0(3.3)	3.0-4.7(3.0)	3.4-4.3(3.9)	2.8-4.3(3.6)	3.8-5.6(4.9)	3.7
	Diameter of hypocotyl-cm	0.09	0.10	0.09	0.12	0.10	0.10

¹ Range with average in parentheses.

² Standard deviations for number of cotyledons: 0.95 slash, 0.83 loblolly, 0.80 shortleaf, and 0.93 Virginia.

Can species of southern pine seedlings be identified when they are in the cotyledon stage? The question usually arises when stands are regenerated by natural means and two species of seed

trees are present. The study reported here was conducted to determine if number or size of cotyledons or characteristics of the hypocotyl can be used to identify four of the major species of southern pine.

Procedure

Slash (*Pinus elliotii* Engelm.), loblolly (*P. taeda* L.), and shortleaf (*P. echinata* Mill.) seeds were collected from 1972 to 1974 in

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central Louisiana from plantation trees of unknown seed sources. Virginia pine (*P. virginiana Mill.*) seeds were collected from clones in the Hiwassee Land Company's seed orchard in Tennessee.

About 100 full seeds from each of 5 trees per species were sown in sand flats and kept in an air conditioned greenhouse at 75° F. The seeds from one tree constituted a lot, and all lots were kept separate.

As soon as seedcoats were shed, the cotyledons on each seedling were counted. On 10 randomly selected seedlings from each lot, the lengths of cotyledons and hypocotyls and the diameter of hypocotyls at ground line were measured. Color and straightness of hypocotyls also were observed on these seedlings.

Results

Number and length of cotyledons and length of hypocotyls overlap among the species and vary widely within species (table 1), even between seedlings from the same mother tree. Conclusive identification of individual seedlings, therefore, is impossible. However, if at least 10 seedlings are sampled, shortleaf pine can be distinguished by length of hypocotyls together with number and length of cotyledons; slash, loblolly, and Virginia pines cannot be distinguished from each other. Hypocotyls averaged 2.1 cm for shortleaf, 3.7 cm for slash and Virginia, and 3.9 cm for loblolly. Shortleaf averaged six cotyledons that were 1.9-cm long; the other species had more and longer cotyledons.

The hypocotyls of all species were the same shade of purple and had about the same diameter. It is often claimed that shortleaf is easy to recognize because young seedlings have a crook in hypocotyls near the groundline. Of 50 seedlings for each species, however, those with deformed hypocotyls totaled 1 for slash and Virginia pines, 3 for shortleaf, and 5 for loblolly.

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branch development is a better indicator of dry weight and vigor than height, and is a better indicator in basswood than in bur oak

Literature Cited

- 1 Ashby, W C
1961 Responses of American basswood seedlings to several light intensities. Forest Sci. 7:273-281.
- 2 Ashby, W.C. and D.T. Funk
1975 Provenance and growth studies of basswood. Proc 9th Central States Forest Tree Imp. Conf., Forest Service, U S Department of Agriculture, North Central Forest Exp. Sta. p 56-61.
- 3 Fowells, H. A. , Compiler
1965 Silvics of forest trees of the United States. Forest Service, U.S. Department of Agriculture, Agric. Handb. 271. 762 p
- 4 Garrett, P.W. and H. C. Kettlewood
1975 Variations in juvenile oak. Forest Service, U.S. Department of Agriculture Research Note NE-204. 4 p.
- 5 Holch, A E.
1931 Development of roots and shoots of certain deciduous tree seedlings in different forest sites. Ecology 12:259-298.
- 6 Logan, K.T.
1966 Growth of tree seedlings as affected by light intensity. III. Basswood and white elm. Canada Dep. Forestry and Rural Dev. , Forestry Branch, Dep. Publ. 1176. 15 p.
- 7 Sander, I.L. and F.B. Clark,
1971 Reproduction of upland hardwood forests in the central states. Forest Service, U-S. Department of Agriculture, Agric. Handb. 405. 25 p
- 8 Stroempl, G.
1971 Planting of basswood is successful in hardwood cutovers. Tree Planters' Notes 22:26-29.