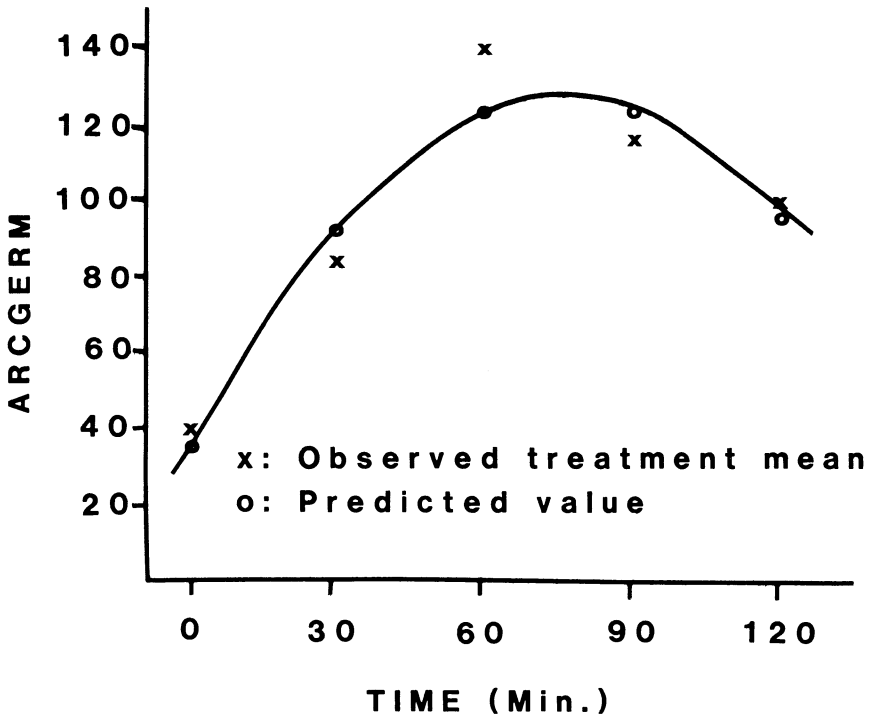

Fig. 1. Germination of acid scarified soapberry seeds. Treatments consisted of 4 replications of 50 seeds each. Regression equation: ARCGERM $= 0.378 + 0.023X - 0.00015X^2$, $R^2 = 0.94$. (ARCGERM = Arcsine transformation of percentage of germination.)

cold-moist stratification may be omitted with little reduction of total germination.

Literature Cited

1. Cram, W. H. 1982. Seed germination in elder (*Sambucus pubens)* and honeysuckle (*Lonicera tatarica*.) HortScience 17(4):618–619.
2. Crocker, R.L. and D.L. Morgan. 1983. Control of weevil (*Curculio* sp.) larvae in acorns of the live oak (*Quercus virginiana*) by heat. HortScience 18(1):106-107.
3. Hartmann, H.T. and D.E. Kester. 1983. Plant propagation: principles and practices. 4th ed. Prentice-Hall, Englewood Cliffs, N.J.
4. Read, R.A. 1974. *Sapindus drummondii* Hook. & Arn., western soapberry. In: seeds of woody plants in the United States, USDA Agr. Handb. No. 450, U.S. Govt. Printing Office.
5. Vines, R.A. 1976. Trees, shrubs, and woody vines of the Southwest. Univ. of Texas Press, Austin.

HortScience 19(5): 713–714. 1984.

Guayule Seedling Root Regeneration Potential Increases with Age

Jimmy L. Tipton

Texas A&M Research and Extension Center, 1380 A&M Circle, El Paso, Texas 79927

Additional index words. *Parthenium argentatum,* transplants

Abstract. **Root generation of guayule (*Parthenium argentatum* Gray) seedlings was determined by suspending 8, 10, and 12 week old plants in a bottom mist chamber. The number and length of new roots were significantly greater after 3, 6, 9, and 12 days for 12 week old as compared to 8 week old plants. The major difference between 10 and 12 week old plants was an increased root length of 0.44 and 1.03 cm, respectively, after 3 days.**

Root regeneration potential measures root initiation and elongation in plants, and has been shown to be important in establishment and subsequent growth of evergreen and deciduous tree seedlings (2, 3, 4, 8). Root regeneration of tree species usually is measured in plants over 1-year-old and can be influenced by shoot and root dormancy, level of carbohydrate reserves, and other factors (2, 3, 4, 8).

Guayule is an evergreen desert shrub currently under investigation as a domestic source of natural rubber (6, 7). Field establishment by direct seeding has not been successful due to small seed size and seedling sensitivity to drought, salinity, and disease. In the present production system, seedlings are greenhouse-grown in small plug-type containers (medium volume of 24 cm^3 or less) and transplanted into the field at 8 to 12 weeks of age. After an initial one week lag in shoot growth at the cotyledonary stage, both shoots and roots grow continuously under these conditions. Transplanting often is conducted under conditions of high evaporative water demand. Under these conditions, seedling survival depends upon maintenance of root-available water, a difficult task because of the confined root volume. Rapid root proliferation into the surrounding soil could enhance water uptake and seedling survival. Observations indicated 12-week-old seedlings survived transplanting better than 8-week-old seedlings. Thus, this research was initiated to investigate seedling age effects on root regeneration potential.

Seeds of a bulk Mexico collection (Langely L78001) were treated with 0.5% NaOCl (5) and sown on Cornell peat-lite mix B (1) in plug-type containers. Eight, 10, and 12 weeks after germination, seedlings of similar size were removed from the containers, the roots washed and pruned to 5 major roots, each 10 cm long. The seedlings were placed in a bottom mist chamber (3) in a greenhouse. The test was conducted during April and May, 1980. Minimum greenhouse temperatures ranged from 14.4° to 17.8°C with a mean of 16.1° Maximum greenhouse temperatures ranged from 26.7° to 43.9° with a mean of 32.8°. The plants were not shaded. Misting frequency was 5 sec per 5 min, 24 hr a day with tap water. New roots were counted and their length measured to the nearest cm after 3, 6, 9, and 12 days. Increases in root lengths were totaled for each plant.

The experimental design was a randomized complete block with 7 blocks and 10 replications per block, 70 plants per treatment. Treatment effects on both new root counts and added length were evaluated via orthogonal polynomial regression. The significant independent variables for both dependent variables were age linear, time linear, age quadratic, time quadratic, age linear by time linear, age linear by time quadratic, and

Received for publication 19 Mar. 1984. Support of the USDA, Native Latex Program is gratefully acknowledged. Mention of trade names is made for identification purposes only, and does not imply any endorsement by the Texas Agricultural Experiment Station. All programs and information of the Texas Agricultural Experiment Station are available without regard to race, ethnic origin, religion, sex and age. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

Table 1. Variables, coefficient values, and SE for the regression of root counts and length on seedling age and time.

Independent variable[z]	Dependent variable: Root count		Dependent variable: Root length	
	Coefficient	SE	Coefficient	SE
Intercept	165.79		148.36	
A_L	−37.29**	3.26	−32.60**	2.93
T_L	−36.32**	2.32	−23.07**	2.09
A_Q	2.05*	0.16	1.76*	0.15
T_Q	−1.40*	0.09	−1.30**	0.08
A_LT_L	8.65**	0.41	5.75**	0.37
A_LT_Q	0.75*	0.01	0.16**	0.01
A_QT_L	−0.50*	0.02	−0.35**	0.02

[z]A = seedling age in weeks, T = time in days, L = linear, Q = quadratic.
*,**Significant at 5% (*) or 1% (**) levels.

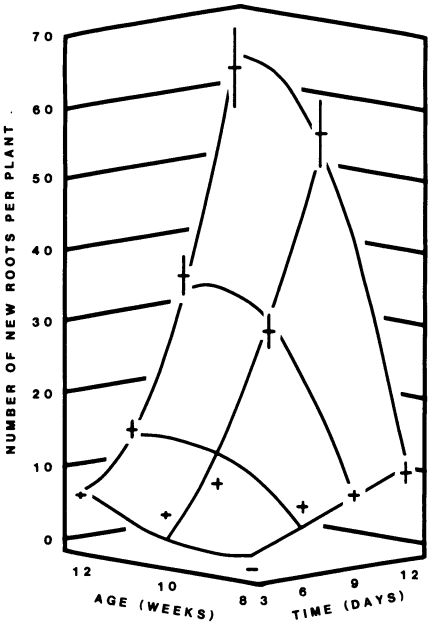

Fig. 1. Response of new root counts to seedling age and time. Horizontal lines represent treatment means and vertical lines represent standard errors. Independent variables and coefficient values are given in Table 1.

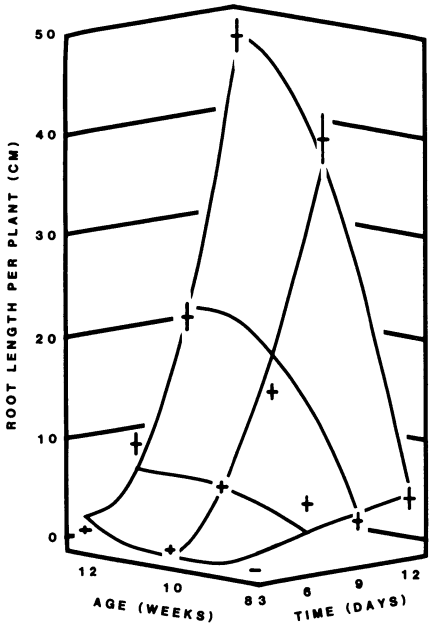

Fig. 2. Response of new root length to seedling age and time. Horizontal lines represent treatment means and vertical lines represent standard errors. Independent variables and coefficient values are given in Table 1.

age quadratic by time linear (Table 1). The model accounted for 98.9% and 98.4% of the variability in new root counts and length, respectively. Response surfaces for both dependent variables are similar (Fig. 1 and 2). The pattern of root regeneration for 10- and 12-week-old seedlings was similar and seems to be exponential while that for 8-week-old seedlings seems linear and is considerably reduced (Fig. 1 and 2). Variability of the dependent variable increased with time for both root count and root length. Twelve-week-old seedlings produced longer roots after 3 days than the 10 week old seedlings. The mean root length after 3 days was 0.44 and 1.03 cm while the mean root count was 5.53 and 6.21 for 10- and 12-week-old seedlings, respectively.

The data indicate the root regeneration potential of guayule seedlings in a bottom mist chamber increases dramatically from 8 to 10 weeks of age. The major differences between 10- and 12-week-old seedlings was the greater root regeneration potential of older seedlings after 3 days. If applicable to field situations, these data suggest that 10- and 12-week-old seedlings may exhibit increased survival after transplanting due improved root soil penetration.

Literature Cited

1. Boodley, J. and R. Sheldrake, Jr. 1967. Cornell peat-lite mixes for commercial plant growing. Cornell Agr. Ext. Bul. 1104.
2. Lathrop, J.K. and R.A. Mecklenburg. 1971. Root regeneration and root dormancy in *Taxus* spp. J. Amer. Soc. Hort. Sci. 96(1):111–114.
3. Lee, C.I. and W.P. Hackett. 1976. Root regeneration of transplanted *Pistacia chinensis* Bunge seedlings at different growth stages. J. Amer. Soc. Hort. Sci. 101(3):236–240.
4. Lee, C.I., B.C. Moser, and C.E. Hess. 1974. Root regeneration of transplanted pin and scarlet oak, pp 10–14. In: The new horizons. Hort. Res. Inst., Washington, D.C.
5. Naqvi, H.H. and G.P. Hanson. 1980. Recent advances in guayule seed germination procedures. Crop Sci. 20:501–504.
6. Tipton, J.L., J.L. Craver, and J. Blackwell. 1981. A method for harvesting, cleaning, and treating achenes of guayule (*Parthenium argentatum* Gray). HortScience 16(3):296–298.
7. Tipton, J.L. and E.C. Gregg. 1982. Variation in rubber concentration of native Texas guayule. HortScience 17(5):742–743.
8. Webb, D.P. 1977. Root regeneration and bud dormancy of sugar maple, silver maple, and white ash seedlings: Effects of chilling. Forest Sci. 23:474–483.