CULTURE AND GENETIC INFLUENCES ON GREENWOOD CUTTING PROPAGATION OF A NEW COLLECTION OF EASTERN COTTONWOOD IN THE SOUTH

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The ***Populus* Crop Development for the Southeastern United States** project goal is to develop genetically suitable Eastern cottonwood *(Populus deltoides Bartr. ex Marsh. Var. deltoides)* clones for short rotation fuel and pulpwood crops. In spring 1997 and 1998, seeds were collected from 72 natural stands representing three regions (East Central (EC), East Gulf (EG), and Southeast Atlantic (SA), (Figure 1) in the Southeast. Seed collections were chosen over cuttings to avoid positional effects (Bonga, 1982) and in favor of increased genetic diversity.

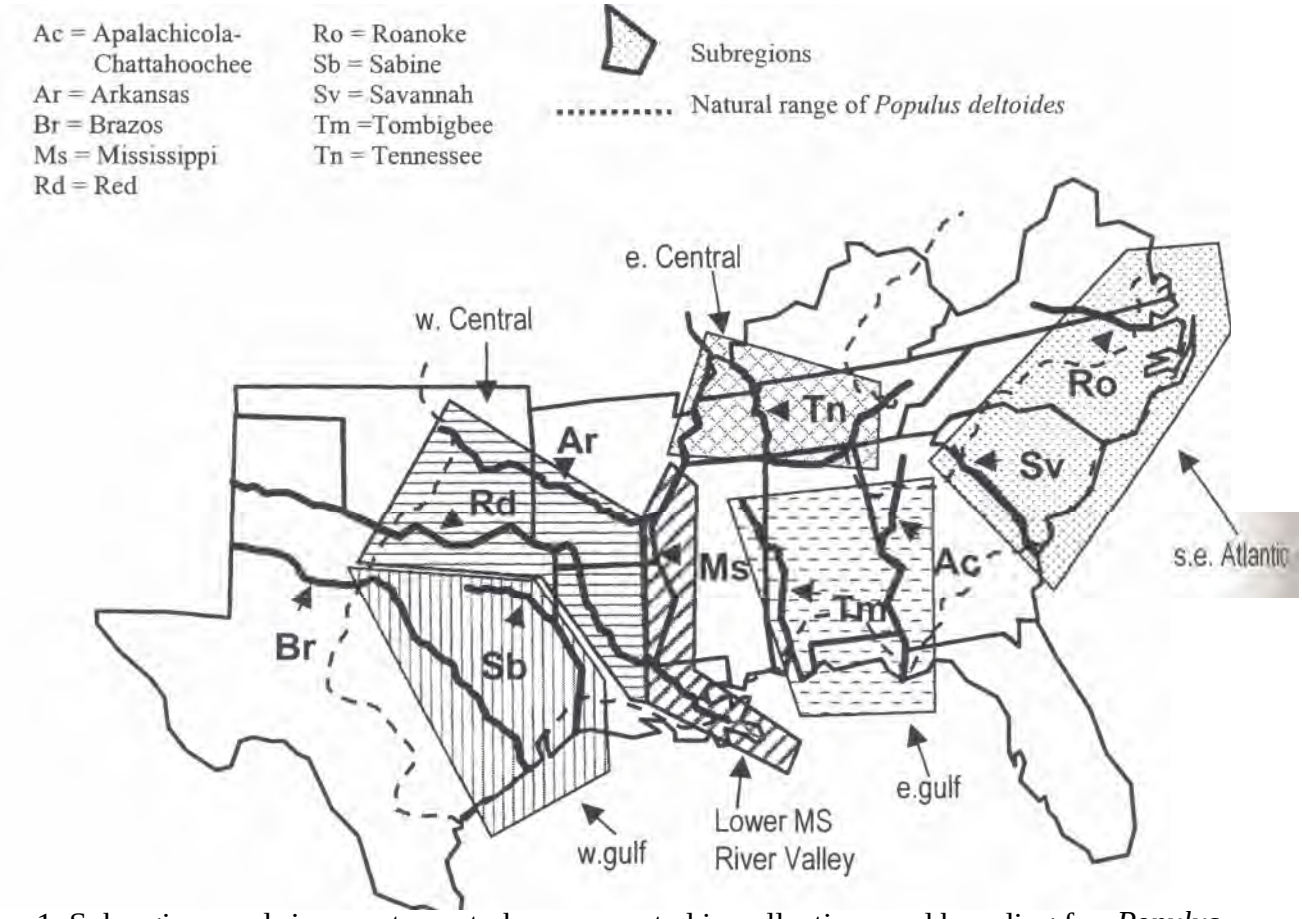

Figure 1. Subregions and river systems to be represented in collections and breeding for *Populus* crop development in the southeast United States.

A total of 185 open-pollinated and 7 control-pollinated families were successfully germinated in a greenhouse in spring 1998. All seeds were sown within 2 weeks of collection using Fafard® Mix NO.4 (Canadian sphagnum peat (40%), processed pine bark, and vermiculite) in 72 cell trays. Banrot, broad-spectrum fungicide was applied to prevent damping off. The 10 most vigorous seedlings from each family were transferred into deep pots 5 to 7 weeks after sowing. The seedlings were fertilized as needed

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using Peters Professional 20-20-20 and Superthrive. The total collection consisted of 195 families with the edition of stecklings from previously tested clones.

Cultural techniques were then examined at small scale. Eight seedlings from each family were top cut at 4 cm. The top cuttings (with leaves retained) were dipped in Indolecbutyric acid (IBA) or naphthaleneacetic acid (NAA). placed in containers using Metromix 300 and peat. Propagules were placed in a green house under misters emitting at 5-minute intervals for 10 second. 99% rooting success was observed. Cuttings dipped in IBA exhibited greater mean height growth after 3 weeks. Further tests indicated that green wood cutting rooted best with the retention of a leaf.

In summer 1998, a small experiment was conducted using 6 clones examining variation in rooting capability within family SA4U2-1. 4 cm green wood cuttings were taken from 9 month old ortet and ramet established at 6 and 3 months previous. Propagule width and number of nodes were recorded. Treatments included the retention of a half leaf, IBA (8000 PPM) powder dip and commercial hormone/vitamin dip (Superthrive®) application and a control. Propagules were placed in a green house under misters emitting at 5-minute intervals for 10 second. Daily temperatures were maintained near 24°C. After 18 days the propagules were examined for survival, presence of calli and root number, dry weight and length. Cultural and clonal effects were tested by ANOVA. Significant differences were tested at the 5% level with Duncan's multiple range test. The results indicated that both cultural treatments and clonal effects significantly influenced survival and rooting capability (Table 1). Rooting capability varied significantly between clones of the same family.

Table 1. ANOVA analysis of rooting performance of 6 clones in family SA-4U2-1

Survivability				Root Dry Wt.			
	DF	MSE	Pr >r		DF	MSE	Pr >r
Clone	5	10407.41	.0001	Leaf Retention	1	0.00045	.0001
Clone x Age	10	4268.52	.0001	Clone x Age	10	0.00069	.0261
Clone x Leaf Retention	10	5518.5	.0001	Clone x Age X Leaf	10	0.00041	.0223

The more successful techniques were subsequently applied to derive 1"^{d}-cycle cuttings. Over 1,500 seedlings provided typically five greenwood cuttings for the first-cycle of propagation (Table 1). Cutting survival of the EC and SA regions was similar at above 60%, but survival of the EG region was less than 50%. Across all regions, river and site differences for survival were non-significant. Stands within rivers/sites and trees/stands, though, were significant and highly significant, respectively.

Table 2. First-cycle greenwood cutting survival by region.

Region	No. of Ortets	Mean (%)	Range among Clones(%)
Eastern Central	*574*	*62.0*	*175 –100.0*
Eastern Gulf	449	48.6	2.9 – 96.7
South Atlantic	523	64.7	17.1 – 97.1
Total	1,546	59.0	

These results support Ying and Bagley (1977) report of variation in rooting capability in cottonwood clones based on race and geographic origin.

Three cutting cycles have been completed. Seedlings were utilized as 1 st cycle source material. Source material in cycles 2 and 3 consisted of seedlings and their stecklings. In each cycle of propagation, variation in rooting success and cutting vigor was attributable to cultural techniques and to genetic factors at the stand, family, and clone levels.

Table 3. Clonal representation by region in tests established to date.

Region	Field trial	
	W.Vaco, MO	Quincy, FL
Eastern Central	279	376
Eastern Gulf	301	228
Southeastern Atlantic	277	242

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