ENHANCED GERMINATION OF *EUCOMMIA ULMOIDES* SEEDS THROUGH *IN VITRO* TECHNIQUES

Zhijun Liu[1] and Antoinette DeBosier[1]

Abstract: Tissue culture techniques provide the best-controlled environment for plant growth. We are using these techniques to propagate *Eucommia ulmoides* Oliver, a potential agricultural crop in Louisiana for medicinal uses and wood products. *Eucommia* is a tree native to China, and is said to have been harvested to near extinction in the wild. Today, this species is being cultivated within several Chinese provinces as plantation forests. However, at present, the amount of *Eucommia* being produced in China satisfies only 30% of the total demand for products made from this species. Germinating *Eucommia* seeds by conventional means appeared to be inefficient (30%) due to gutta percha, a natural rubber-like compound found in the fruit and seed coats of this species. The gutta percha acts as a barrier that inhibits imbibition. Moreover, with a limited number of seeds, we cannot afford low germination rates. *These challenges prompted us* to *develop a secured* propagation protocol using tissue culture techniques. In this study, the effects of the length of imbibition, different light conditions, and mechanical breaking of the seed coats through piercing were examined *in vitro* on the enhancement of seed germination.

A total of 666 seeds, collected from Zhejiang and Beijing, China, during October of 1997, were used in this study. The seeds were divided into three groups for treatment purposes, as described in Table 1. To reduce contamination, seeds (with fruitcoats attached) were first surface sterilized. Fruitcoats were then removed by hand under a laminar hood. Culture medium was prepared using MS salts, sucrose, and agar, and the pH adjusted to 5.7. Forty-five milliliters of medium was poured into 100ml-glass culture vessels and autoclaved for 20 minutes at 121° C. One seed was placed in each vessel.

Table 1. Method in which 666 *Eucommia* seeds were divided for use in three different tests involving *fourteen treatments during a germination study conducted in 1998.*

	Test I		Test II						Test Ill					
TRTMNT	Piercing		Control (not pierced)		Radicle Pierced		Distal end Pierced		Control (not pierced)		Primed 1 hr		Primed 24 hrs	
	Control	Pierced	Dark	Light	Dark	Light	Dark	Light	Dark	Light	Dark	Light	Dark	Light
# SEED	75	75	36	36	36	36	36	36	50	50	50	50	50	50

The following results were noted:

1) Piercing the seed coat increased germination rates to 87%, as compared with 13% in the non-pierced seeds.
2) Piercing the radicle end of the seed enhanced the germination rate to 88%, as compared with 44% for distal pierce and 21% for the control (non-pierced).
3) On average, radicles emerged within 2.5 days after piercing the radicle end of seeds, as opposed to an average of 5.8 days for distally pierced seeds.
4) Increasing priming time led to increased germination rates (24 hours: 56%; 1 hour: 40%; and control (no priming): 19%).
5) Different light environments showed no effect on germination rates.

School of Forestry, Wildlife, and Fisheries, LSU Agricultural Center, Baton Rouge, LA 70803

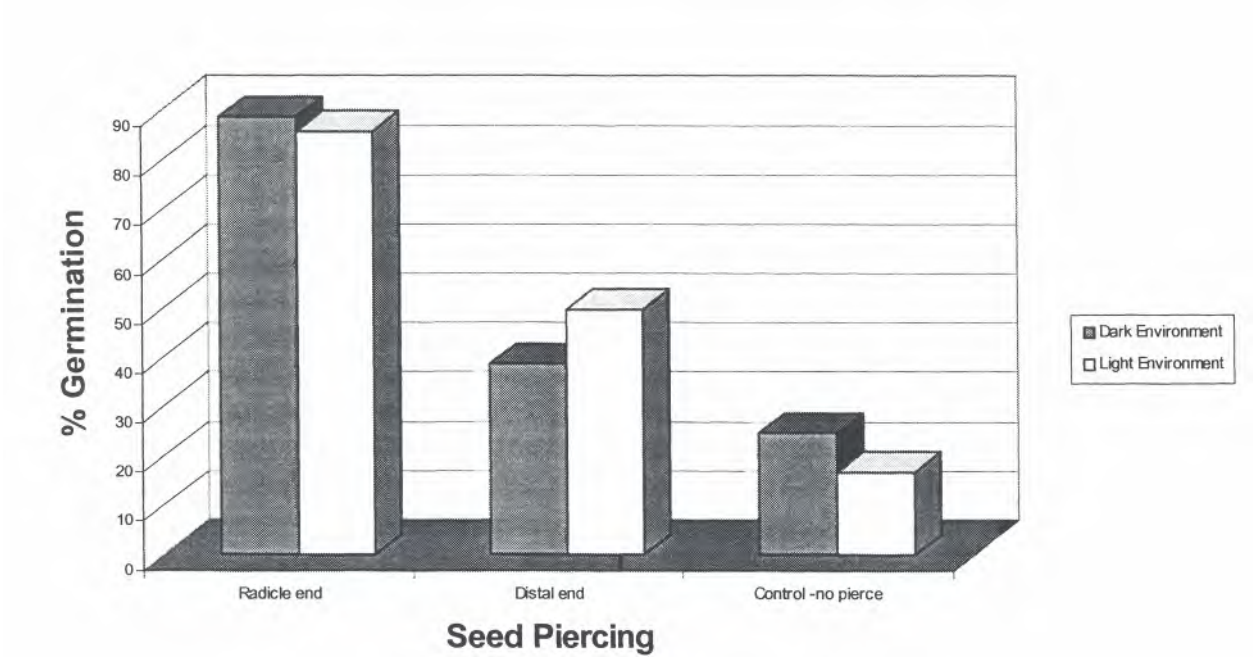

Figure 1. Germination rate (%) in response to seed piercing and light treatments in *Eucommia ulmoides* seeds.

In conclusion, the germination rate of *Eucommia* seeds was enhanced as the length of priming increased, reaching up to 56%. Germination rates also increased with piercing the radical end of the seed, to nearly full germination rates (Figure 1). However, different light environments showed no effect on the germination rate. It is concluded that *in vitro* germination provides an efficient way of germinating hard-to-germinate seeds such as *Eucommia.* The enhanced germination through *in vitro* culture is useful in securing seedlings when seeds are limited, and the germinated seeds are a good source of explant material for subsequent mass micropropagation. We are currently conducting a study to develop a protocol for mass propagation of *Eucommia ulmoides* through the culture of nodes obtained from the *in vitro* germinated *Eucommia* seedlings of this study.

References

Bonga, J. M. 1982. Tissue Culture Techniques. *In* Tissue Culture in Forestry. *Edited by J.* M. Bonga and D. J. Durzan. Martinus Nijhoff and Dr. W. Junk, Publishers. Boston, MA. pp 4-35.

Du, H. 1996. Cultivation of *Eucommia ulmoides* for high quality and high yield. China Forestry Press, Beijing. (Text in Chinese, translation by Zhanhai Li, Graduate Student, School of Forestry, Wildlife, and Fisheries, Louisiana State University).

Farmer, R. E. 1997. Seed Ecophysiology of Temperate and Boreal Zone Forest Trees. St. Lucie Press, Delray Beach, FL. 249p.

George, E. F. 1993. Plant Propagation by Tissue Culture, Part I: The Technology. Butler and Tanner, Great Britain. 574p.

Hartmann, Hudson T., Dale E. Kester, Fred T. Davies, and Robert L. Geneve. 1997. Plant Propagation: Principles and Practices. Prentice-Hall, Upper Saddle River, NJ. pp 549-624.

Kyte, Lydiane and John Kleyn. 1996. Plants from Test Tubes, An Introduction to Micropropagation. Timber Press, OR. 240p.