DEVELOPMENT OF A WHITE OAK SOMATIC EMBRYOOGENESIS SYSTEM TO AID PRODUCTION OF ELITE WHITE OAK GENOTYPES

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White oak (*Quercus alba*) is one of the most valuable North American oaks for a range of products, including furniture, flooring, and perhaps most critically, barrels for aging fine bourbon. The world-wide rise in demand for U.S. bourbon over the past decade has resulted in a concomitant rise in demand for white oak cooperage, which has in turn resulted in a shortage of high-quality white oak wood. A combined breeding and clonal propagation system for production of elite white oak genotypes could make a real long-term contribution to resolving this shortage. However, oaks are notorious for their long life cycles (i.e. time from seedling to flower production) and for their recalcitrance to clonal propagation by such methods as rooted cuttings or tissue culture. A robust somatic embryogenesis system for the species could help resolve both issues by providing a route for the gene transfer needed to accomplish rapid cycle breeding using early flowering genes, and by supplying the means to clonally propagate elite white oak genotypes once they are identified. In a preliminary experiment, developing acorns were collected from two white oak source trees periodically throughout July 2014 and dissected to obtain immature seeds, which were cultured on a modified woody plant medium (WPM) supplemented with either 2 or 4 mg/L 2,4-D. Within two months, multiple explants from both trees produced either clusters of repetitive somatic embryos or proembryogenic masses (PEMs). Once established, cultures were transferred to fresh medium every 3 weeks. Cultures showing the most rapid growth were inoculated into liquid medium and grown on a gyratory shaker at 90 rpm, where they formed suspension cultures. Suspension cultures were size-fractionated on stainless steel sieves and the selected size fraction was cultured on basal WPM for somatic embryo production. Relatively synchronous populations of somatic embryos were produced from six of the culture lines, representing both source trees. As the embryos matured, those with the best form were picked and moved to fresh basal WPM for further enlargement, prior to being given different pre-germination treatments, which tested the effects of pre-germination cold treatment and activated charcoal (AC) on germination. Cold storage at 8º C for 8 weeks are resulted in germination of multiple somatic embryos from different culture lines following transfer to a lighted incubator in GA-7 vessels (Magenta Corp) containing basal WPM with or without 0.5 g/L AC. Several embryos germinated (i.e. produced taproots) on medium with or without AC. Some embryos on medium with AC produced both roots and shoots with expanding leaves.

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