ROLE OF SUMMER FERTILIZATION IN TH E NUTRITION AND CARBON RELATIONS OF LOBLOLLY PINE REPRODUCTION

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A 4-year study of loblolly pine reproduction dynamics was initiated in January 2015 in a southwest Louisiana seed orchard 20 years after ramet establishment. The immediate goal of this study is to identify operational treatments that enhance the cone production and seed efficiency of desirable loblolly pine genotypes. We initially hypothesized that summer fertilization and irrigation influence ramet nutrition and carbon source-sink relations to ultimately affect female strobili differentiation, the retention of female strobili and conelets, and the production of cones with a high seed efficiency. Levels of fertilization are (1) operational fertilizer application (OFA) of essential macro- and micronutrients as recommended annually by the Western Gulf Forest Tree Improvement Cooperative, (2) OFA plus mid-summer application of P, and (3) OFA plus mid-summer application of both P and N. Levels of irrigation applied in 2015 were ambient rainfall and drip irrigation of 288 gallons of water per ramet each day between July 10 and September 21. Ramet observations and treatment responses in 2015 warranted omission of the irrigation treatment in 2016. Ramets of one loblolly pine clone (30 in 2015 and 24 in 2016) were intensively measured to quantify vegetative and reproductive phenology, shoot leaf area by production year and flush, seasonal foliar nutrition, fascicle-level photosynthesis, and cone and seed yields. Data have identified windows of time when the carbohydrate supply for reproduction may be jeopardized by the carbohydrate demand of developing sinks. In 2016, for example, dramatic female strobili abortion coincided with the simultaneous occurrence of high flush and immature cone carbohydrate demands and prolonged cloudiness. The influence of fertilization treatments on aspects of ramet physiology that are important to reproduction during these windows of potential carbohydrate stress will be investigated in 2017 and 2018.

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