Breeding shrub willow as a feedstock for bioenergy, biofuels and bioproducts

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The development of perennial energy crops as feedstocks for biorefineries and bioenergy will combat global warming and contribute to petroleum independence, while stimulating rural economic development. Dedicated woody crops, such as fast-growing shrub willow (*Salix* spp.) will become an essential part of the feedstock supply. There is wide genetic diversity across the genus *Salix*, with great potential to produce improved varieties through controlled breeding. The genus *Salix* includes over 300 species, many of which can hybridize naturally or through controlled pollination. In assembling an extensive, genetically diverse breeding population of shrub willow, SUNY-ESF has collected representatives from more than 10% of the known species of *Salix*. Many of these individuals have been used as parents in our breeding program, producing over 300 new families representing over 25 species and species hybrids. Breeding compatibility was species- and gender-dependent with intra-specific crosses generally successful more often than inter-specific crosses. Typically ~75 to 100 individuals from each viable cross were planted in field plots, then the best families and individuals within families, based on height of the tallest stem, total stem diameter per plant, and rust resistance, were selected after the first or second season post-coppice. Selected individuals were then planted in replicated, randomized selection trials. After two 2-year rotations, yields in excess of 22 metric tonnes ha^{-1} have been recorded (based on 4-plant plots on one site). Individuals displaying exceptional growth have been planted in replicated yield trials in New York, Minnesota, and Alberta (Canada), with several additional trials planned for 2007.

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