

Traditional and Novel Approaches in Poplar and Willow Science

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The Fourth International Poplar Symposium - "Meeting the Needs of a Growing World through Poplar and Willow Science: Combining Traditional and Novel Approaches in the Genomic Era" - was held in Nanjing, China, June 5-9, 2006. The symposium was hosted by Nanjing Forestry University and was sponsored by IUFRO units 2.08.04 and 7.01.04. Current findings in poplar and willow science were presented in plenary and contributed paper sessions in four thematic areas:

- 1) **Advances and Applications in Poplar and Willow Genomics and Biotechnology,**
- 2) **Advances In Conventional Poplar Breeding and Gene Conservation,**
- 3) **Using Poplars and Willows to Provide Ecosystem Services and Bioenergy, and**
- 4) **Poplars in a Changing World: Understanding Responses to Climate Change.**

Significant findings reported during the symposium were as follows:

Genomics and Biotechnology – A report on the large number of genes encoding enzymes and proteins involved in secondary wall biosynthesis suggested selection for retention of duplicated genes in the *Populus* genome. It was also reported that the *Populus* genome of approximately 45,555 genes has undergone three separate genome-wide duplication events in its evolutionary past, the most recent of which was reported to have occurred 8-12 million years ago. Studies of *Populus* transformation in China noted effective control of insect attack and tolerance of soils with high salt contents. Preliminary findings were presented that showed gene flow from transgenic plantations may not be as overriding a consideration as originally envisioned in the risk assessment of this technology in northern China. A modeling exercise reported that sterility genes provide high levels of transgene containment, even in cases where sterility may be incomplete.

Poplar Breeding - The value of non-recurrent hybridization when used in support of developing operational programs was detailed in the continuous turnover of elite varietal pools when evolving pathogen virulence is a concern. There is an increasing realization of the need to integrate molecular tools with rapid selection and screening programs for a range of products and ecosystem services. A status report was made on the extensive breeding program being conducted for *Populus deltoides* and its hybrids for wood production and agro-forestry programs in the lower reaches of the Yangtze River. A statistical framework was presented for characterizing morphological variation in allometrical traits; the intent is to define ideotypes that display optimal resource-use efficiency. –Chromosome-doubling methodologies for both male and female gametes for the efficient production of high-yield, triploid *Populus tomentosa* varieties were reported. This effort will accelerate triploid breeding for yield and wood quality.

Ecosystem Services – Silvicultural systems were described for several ecosystem services including streamside stabilization, habitat restoration, and agro-forestry production. Reports also detailed the significant role that *Populus* is now playing in the remediation of industrial sites contaminated with heavy metals, organic solvents, etc. Transgenic varieties were reported to have enhanced potential to remove environmental pollutants. It was reported that a wide variety of *Populus* endophytes could improve the efficiency of phyto-remediation.

Climate Change - The effect of climate change was detailed in the molecular responses of salt- and drought-stressed genotypes of *Populus euphratica* as well as the phenological response of *Populus* hybrids to changes in carbon dioxide and ozone levels. Transcriptional activity also revealed the effect of a carbon-enriched atmosphere on protein metabolism, lignin biosynthesis, and cell wall thickening in aspen.

Abstracts from the International Poplar Symposium IV are available at:
<http://www.iufro.org/science/divisions/division-2/20000/20800/20804/>

Photo by Brian Stanton. Delegates inspecting a *Populus deltoides* propagation nursery in Jiangsu Province. Rooted sets - two-year-old roots stock supporting coppiced one-year-old sprouts are lifted from nurseries and used in establishing poplar plantations and agro-forestry projects ensuring good survival rates.

