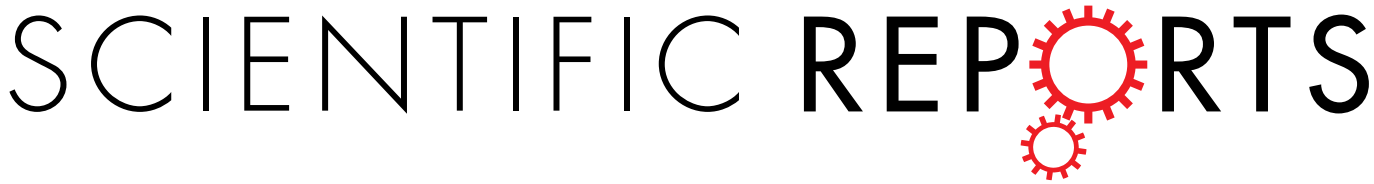

OPEN

Received: 31 August 2016
Accepted: 20 September 2016
Published: 10 October 2016

# Genetic evaluation of the breeding population of a valuable reforestation conifer *Platycladus orientalis* (Cupressaceae)

Yuqing Jin[1,*], Yongpeng Ma[2,*], Shun Wang[3], Xian-Ge Hu[1], Li-Sha Huang[1], Yue Li[1], Xiao-Ru Wang[1,4] & Jian-Feng Mao[1]

***Platycladus orientalis*, a widespread conifer with long lifespan and significant adaptability. It is much used in reforestation in north China and commonly planted in central Asia. With the increasing demand for plantation forest in central to north China, breeding programs are progressively established for this species. Efficient use of breeding resources requires good understanding of the genetic value of the founder breeding materials. This study investigated the distribution of genetic variation in 192 elite trees collected for the breeding program for the central range of the species. We developed first set of 27 polymorphic EST-derived SSR loci for the species from transcriptome/genome data. After examination of amplification quality, 10 loci were used to evaluate the genetic variation in the breeding population. We found moderate genetic diversity (average $H_e = 0.348$) and low population differentiation ($Fst = 0.011$). Extensive admixture and no significant geographic population structure characterized this set of collections. Our analyses of the diversity and population structure are important steps toward a long-term sustainable deployment of the species and provide valuable genetic information for conservation and breeding applications.**

*Platycladus orientalis* (L.) Franco, a member of the family, Cupressaceae, is one of the dominant forest species in China. It is native to northwestern China, Korea, and the Russian Far East, with a range from the south of Mongolia to the south-central China, with also a limited suitable area in Tibetan Plateau[1,2]. It is also now naturalized as an introduced species in Japan and India. This species is characterized with salt, drought and barren-tolerance, wide adaptability and strong resistance. Its roots can increase apparent soil cohension at a slope scale such as Loess Plateau, thus playing significant roles in windbreak and sand stabilization[3]. Consequently, it is commonly used for ecological restoration projects in arid mountain landscapes of northern China, where reforestation projects are extensively applied for sand stabilization and soil erosion control in the past decades. As a popular urban tree in cities in the northern China, it has remarkable ability to absorb and accumulate the atmospheric pollutants ($SO_2$, $Cl_2$) and heavy metal pollutants (Cu, Zn, As, Hg, Pb, Cd and Cr) in soil[4]. In addition, the woods are markedly decay-resistant and have outstanding resistance to humidity, making it valuable in building, furniture, and ship construction. It produces secondary metabolites that have insecticidal or biological activity against insects[5]. Because of these values, the demand for planting this high quality trees is increasing.

Started in the 1980 s, tree improvement and breeding activities of *P. orientalis* were established through provenance testing, phenotypic selection, and seed orchard establishment. Breeding populations were established based on extensive collection and testing of elite trees (plus trees) from range wide. The selected elite trees were collected into breeding archives and used to establish seed orchards for producing genetically improved seeds for plantation forests. Genetic basis of the breeding population decides the genetic quality and long-term potential

[1]National Engineering Laboratory for Tree Breeding, Key Laboratory of Genetics and Breeding in Forest Trees and Ornamental Plants, Ministry of Education, College of Biological Sciences and Technology, Beijing Forestry University, Beijing, China. [2]Kunming Botanical Garden, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming, China. [3]National Tree Breeding Station for *Platycladus orientalis* in Jiaxian, Forest Farm of Jiaxian County, Henan, China. [4]Department of Ecology and Environmental Science, UPSC, Umeå University, Umeå, Sweden. *These authors contributed equally to this work. Correspondence and requests for materials should be addressed to J.-F.M. (email: jianfeng.mao@bjfu.edu.cn)