

Main Achievements of Cotton Large-scale Transformation System

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Cotton large-scale transformation methods system was established based on innovation of cotton transformation methods. It obtains 8000 transgenic cotton plants per year by combining *Agrobacterium tumefaciens*-mediated, pollen-tube pathway and biolistic methods together efficiently. More than 1000 transgenic lines are selected from the transgenic plants with molecular assistant breeding and conventional breeding methods. Based on these methods, more than 10 transgenic cotton varieties, such as CCRI 41 and CCRI 45, were bred and commercialized. The system won the Second Class National Award of Sciences and Technological Improvement in 2005. There are 28 cotton varieties/lines adapted to the *Agrobacterium tumefaciens*-mediated transformation system, average transformation rate is 4.1%. About 4500 transgenic plants could be obtained per year. Among the systems, transformation rates of several CRI24 plants, which selected by the petiole-tissue-culture system (patented), are more than 36%, transformation cycles are about 5-6 months. Pollen-tube pathway method many varieties or lines with good traits are transformed by this method, twice per year in Hainan Province and Anyang, Henan Province. About 30 kg seeds could be harvested on average 4.9% have anti-biotic resistance. This method is flexible, no genotype-dependence and easier to maintain acceptors good agronomic traits despite of multi-copies in the transgenic plant. Biolistic method bombards meristem tissues and embryoid tissues gene-gun, the anti-biotic resistant plants are obtained after recovery culture and a series of selective cultures. Then, plants are transplanted by grafting in greenhouse to do molecular appraisal in order to get transgenic plants. This method has a short time transformation cycle and has no genotype-dependence, but the transgenic plants are often multi-copy of target gene and chimerical. Transgenic plants with high expression of target gene and good agronomic traits are bred by combining conventional breeding and molecular assistant breeding methods more than 5 generations, the stable lines are transferred to cotton breeders to breed new cotton varieties. Up now, more than 1000 transgenic lines are transferred to breeder and more than 10 varieties were developed. More than 100 cotton mutants, mainly leaf, flower, boll, and height mutants, were identified by genetics and molecular methods from transgenic variant plants, most of them are dominant mutants. All field experiments of transgenic materials are ruled by laws and rules constituted by government. Forty-two certificates for commercial production were obtained. Cooperation involved 85 genes/vectors (including boll-worm resistance, aphid resistance, cotton fiber quality, and drought tolerant genes) that were cloned/constructed by scientists in Biotechnological Research Institute, CAAS, Genetic and Growth Institute, CAS, Tsinghua University, Fudan University, Shanghai Jiao tong University, University of Science and Technology of China, China Agricultural University, etc., and three genes obtained from Brazil, were introduced with bilateral agreements, then transformed and produced many new lines or new cultivars.

Key words: cotton; transformation; GMO; mutant