Genetic Engineering for Breeding for Drought Resistance and Salt Tolerance in Agropyron Spp. (Wheatgrass)

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Introduction Genetic engineering for breeding for drought resistance and salt tolerance in wheatgrass, lucerne and tall fescue is one of the main projects in a major national programs as part of the10th'five-year national plan: "Research of gene transfer in plants and its industrialisation". It is a large project that has financial support for work on forage crops in China and many research institutes and universities take part in it. The Inner Mongolia Agricultural University is in charge of the project on wheatgrass. The research was started in Nov. 2002. The general situation and the primary results are introduced and summarised in this paper.

Material and method Four species of wheatgrass (*Agropyron mongolicum, A .cristatum* cv. 'Fairway', *A. desertorum* cv. 'Nordan' and *A .cristatum* ×*A. mongolicum* cv. 'Hycrest-Mengnong') were used as the basic plant material. Based on an established regeneration system, the p5CS gene, which regulates the last step of proline synthesis, was transformed into these species, with phosphinothricin acetyltransferase (*bar*) conferring herbicide resistance as the selectable gene. The transformation was conducted through microprojectile bombardment of callus derived from immature inflorescence and the transgenic plants were examined by PCR Southern and RT-PCR analysis.

Results The results showed that callus initiation from immature inflorescence and plant regeneration could occur under induction in all four species. The medium for callus induction was the improved culture MS+2,4-D (2.0mg/L), with induction frequency up to 83.5%. The differentiation medium was hormone free MS+KT (0.2mg/L) and the differentiation ratio about 74.5%. One hundred percent of roots could be induced under the culture medium as 1/2 MS.

Transgenic plants were obtained by microprojectile bombardment of callus induced from immature inflorescence. The results of PCR and Southern analysis of transgenic plants indicated that the exogenous p5CS gene had integrated into the genome of the plants. RT-PCR assay showed that the p5CS transgene was expressed at a transcript level.

Conclusions Wheatgrass is one of the grasses which are suitable for genetic transformation. The culture system of callus and plant regeneration was optimized. Integration of the exogenous p5CS in the research material was demonstrated by molecular examinations. The transgenic frequency for the p5CS gene was about 0.1%. The transgenic plants obtained provide new genetic resources for further breeding improvement.