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Use of *in vitro* culture to obtain new source material and selection of stress-resistant interspecific *Populus* hybrids

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Motivation and aim: Problems of climate aridization and desertification of territories, degradation and destruction of soils require the creation of a system of protective forest plantations of fast-growing stress-resistant factors of wood species. The purpose of the study was to develop selective systems *in vitro* and obtain on their basis the initial breeding material of the interspecific *Populus hybrids*, resistant to the modeling stress factor.
Materials and methods: Controlled crossing the selected parental pairs (*P. bolleana* × *P. alba* (F_1-2), *P. deltoides* × × *P. alba* (F_1-3), *P. nigra f. piramidalis* × *P. alba* (F_1-5), *P. deltoides* × *P. bolleana* f. *piramidalis* (F_1-7)). The obtained immature seeds were transferred to the Laboratory of Biotechnology of the Federal Scientific Centre of Agroecology of the Russian Academy of Sciences. By the method of isolating immature embryos, the sterile culture of the *Populus* F1 genotypes received and multiplied *in vitro*. As a selective agent for modeling osmotic stress, a polyethylene glycol with a molecular weight of 6000 (PEG) at concentrations from 1 to 7% was introduced into the medium according to the Murashige and Skoog protocol (MS). The conditions of salinization in the *in vitro* culture were modeled with NaCl at concentrations of 0.2; 0.5 and 1,0%. The assessment of resistance to a selective factor was carried out after six weeks of cultivation by the number of survived and capable to regenerate explants.
Results: At the stage of introduction into an aseptic culture by the method of isolated embryos, more than 150 genotypes of interspecific *Populus* F_1 hybrids from four crossbreeding combinations were obtained. The optimal composition of the media for the multiplication and induction of rhizogenesis was selected. Also the genotypic reaction of hybrids during micropropagation, which manifested in the rate of regeneration potential, was noted. The parameters of the spectral composition and light intensity were determined, stimulating the morphogenesis processes of poplars' microshoots. The general patterns of the PEG and NaCl influence on *Populus* F_1 hybrids' regenerants were determined, with an increase of its concentration in the media, there was an inhibit of morphogenesis processes, up to their complete stop, slowed the work of a photosynthetic apparatus and changes in the stomata cells. Adaptation reactions to the conditions of osmotic and salt stress were their ability to morphogenesis and regeneration. The selection of resistant to stress factors *Populus* F_1 genotypes made it possible to determine seven potentially drought-resistant and four salt-resistant candidates for further testing in the greenhouse complex conditions and field tests.
Conclusions: As a result of the studies, *in vitro* selective systems have been developed for the breeding of stable interspecific hybrid genotypes, which will reduce the time for selection of genotypes with given signs. The technology of obtaining the initial breeding material is optimized by the method of isolated embryos from immature embryos of *Populus* F_1 hybrids.
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