Thematic area Nanochemistry and biotechnology

Capacity of novel DMAEM-containing polymeric carriers for delivery of foreign genes into plant cells

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Development of modern biotechnology and agriculture is closely connected with the application of novel and efficient methods of genetic engineering. At present, different methods are used for gene delivery into economically valuable crop plants. However, the efficiency of these methods might be affected by a complexity of transformation procedure and the influence of multiple factors that are difficult to control. Viral-based methods of gene delivery stay under big critics, thus, methods of the non-viral nanoparticle-mediated plant transformation gain more attention because of their stability, biosafety, and easy performance.

In this work, new polymeric DMAEM (dimethylaminoethyl metacrylate)-based nanoscale carriers were synthesized and investigated for foreign gene delivery into plant cells.

Formation of stable complexes between TN 83/6, TN 84/5, DLM-9-DM and LM-8-DM polymers and plasmid DNA (pDNA) containing coding sequence of reporter green fluorescent protein (*gfp*) gene, as well as the nuclease protection by the these poly-DMAEM carriers against DNA degradation were demonstrated by electrophoresis in agarose gel. The results of ana-telophase test in *Allium cepa* did not show a presence of the genotoxic effects (chromosomal aberrations) of the polymeric carriers. Over 70% survival of protoplasts was found also after treatment of these polymers.

The transformation frequency of *Nicotiana tabacum* protoplasts was 16% when TN 84/5 polymer was used as pDNA carrier, 5% – for DLM-9-DM and 3% – for LM-8-DM. Sixteen stable *Ceratodon purpureus* transgenic clones were picked up using TN 83/6 carrier, 20 clones – using TN 84/5 carrier, and 1 clone – using DLM-9-DM carrier.

Thus, novel poly-DMAEM-containing polymers might be promising carriers for delivery of pDNA into plant cells.