Screening of salt-resistant factors from a mangrove plant

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Summary

Mangrove is a general term for salt-tolerant woody plants growing along the seashore in tropical and subtropical areas. The reason why mangrove plants can grow in such habitats is not investigated at molecular levels. We postulate that mangrove plants have got specific proteins essential for the salt tolerance in its evolutional process. Based on this hypothesis, functional screening of mangrove cDNAs encoding such proteins was performed using *Escherichia coli* as a host organism. Twenty-nine *E. coli* transformants, which showed remarkable growth under salt-stress conditions, were obtained from 1 x 10^6 *E. coli* transformants. Analysis on the fragment patterns by restriction endonuclease digestion and on determination of their partial nucleotide sequences showed that twenty-three clones have an identical nucleotide sequence. A full-length cDNA is 1018 bp and the ORF encodes a protein of 141 amino acids including 28 serines (19.86%). It is revealed that there are no similar proteins of all other entries in databases. We designated this protein to "mangrin". In order to test the effect of mangrin expression on salt-tolerance in eucaryotic cells, mangrin cDNA ligated with *GAL1* and 35S promoter were introduced to yeast and tobacco cell culture, respectively. As well as *E. coli* experiment, the growth rates of these cultures expressing mangrin were enhanced as compared to the control strains. It is possible that mangrin may function to give salt-tolerance to diverse organisms at cellular level. In order to test the effect of mangrin expression on the salt-tolerance in higher plant at organ level, mangrin cDNA driven by 35S promoter was introduced to tobacco plants. Growth of control transformants was strongly inhibited by addition of 150 mM NaCl to the medium. In contrast, transformants expressing mangrin showed remarkable well growth as compared to the controls in medium containing 150 mM NaCl. Southern blot analysis on various plant species using a mangrin cDNA probe indicated that other plant species have not mangrin or its homologue. Mangrin may specially exist in mangrove plants.

Discovery of mangrin will contribute to elucidate salt-tolerance mechanisms in mangrove plants at molecular biological level. Biosynthesis of mangrin will open a new window to enhance salt-tolerance of higher plants, including crop plants.