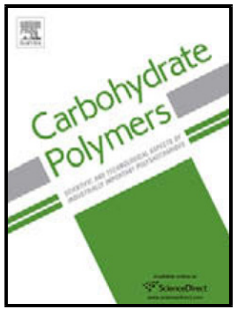


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**Development of chitosan-sodium phytate nanoparticles as a potent antibacterial agent**

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**Highlights**

- Chitosan-sodium phytate nanoparticles were prepared by ionic gelation technique.
- The nanoparticles were spherical with a size of 20–100 nm under optimal conditions.
- High antibacterial activity of the nanoparticles against five bacteria was found.
- The nanoparticles maintained superior acidic and thermal stability.
- No cytotoxicity for normal liver cells was found for the developed nanoparticles.

**Abstract**

Chitosan nanoparticles have attracted considerable attention as a potential carrier for food and pharmaceutical applications. Herein, using natural sodium phytate as a gelation agent, we developed a new type of green and biocompatible chitosan nanoparticles. We discovered that the chitosan-sodium phytate nanoparticles exhibited potent antibacterial activities. The chitosan-sodium phytate nanoparticles prepared from low molecular weight (LMW, 140±7 kDa) and medium molecular weight (MMW, 454±21 kDa) chitosan were spherical. Under optimum conditions—with a ratio of LMW chitosan to sodium phytate of 24:1 and MMW chitosan to sodium phytate of 21:1—the sizes of the LMW and MMW chitosan nanoparticles were 20–80 and 80–100 nm, respectively, as observed by transmission electron microscopy. The formation mechanism of chitosan nanoparticles occurred through both electrostatic interactions and hydrogen bonds. No cytotoxicity for normal liver cells was found in chitosan-sodium phytate nanoparticles measured by methyl thiazolyl tetrazolium assay. Furthermore, the antimicrobial assays indicated that the antimicrobial activity of the LMW chitosan nanoparticles was greater than that of MMW chitosan nanoparticles. The minimum inhibition concentration values and half inhibiting concentration of LMW chitosan-sodium phytate nanoparticles for *Escherichia coli* were 1.5 and 0.8 mg/mL, respectively. In