SUMMARY

Preparation of phytobio-stimulants based on chitosan and chitosan chito-oligosaccharides with antimicrobial effect

In this research, obtention and use of products with a high added value, such as chitin, chitosan and chito-oligosaccharides from a protein-chitinous byproduct (shrimp scraps) was explored, in order to contribute to solve some agronomic problems. Obtaining these by-products is not a new area, however, the use of aggressive treatments with concentrated acids and alkalis as usually is done, give raise to problems of environmental pollution, as well as that the resulting products have some content of dangerous metallic substances. Therefore, we use 2% shrimp waste suspended in tap water as a culture medium to grow *Bacillus thuringiensis* strain Bt- 112 during 96 h at 28°C. The bacterial extracellular protease produced during this fermentation reduced 73% the protein content of the chitinous- protein waste. This material was recovered by centrifugation at 5000 rpm for 10 min. The obtained pellet was dried overnight at 40°C and then treated with NaOH at 50% for 4 h at 60°C with shaking, in order to deacetylate the chitin to obtain chitosan. Finally, the chito-oligosaccharides were produced by growing the strain Bt- 112 in a medium with the obtained chitosan suspended at 2% in tap water along 96 h at 28°C. The chitosan obtained in this process was 78.26%. The chito-oligosaccharides obtained were at least 11 compounds including mono, di, three and tetrasaccharides. On the other hand, in this study the possible use of the obtained compounds was studied, finding that chitin had excellent properties as a soil texture enhancer, biofertilizer as well as stimulator of growth of beneficial biota. With respect to chitosan, this substance showed high inhibition properties on the fungal growth of 15 organisms tested. Similar inhibitory results were observed with the chito-oligosaccharide mixture obtained. Finally, molecular weight and the degree of deacetylation for chitosan and the presence or absence of chito-oligosaccharides was evaluated. It was found that activity of the solubilized compounds could be maintained along 6 months when were kept at 4°C, or more time if they were in solid form. The chitosan obtained was solubilized in different substances as ascorbic, acetic and lactic acids, although best results were obtained in the acetic acid. The chito-oligosaccharides also were soluble in water.

Key words: Chitin, chitosan and chito-oligosaccharides