SYNTHESIS OF MODIFIED PECTIN AND FURTHER DEVELOPMENT TO FORM MICRO-GEL PARTICLES USING 1,4-BIS(3-AMINOPROPYL)PIPERAZINE

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The experiment was made to attach amino ligands to pectin molecules while overcoming the problem of hydrolysis of pectin in water. After the successful synthesis, the modified pectin was cross-linked into micro-gel particles for further uses.

Pectin is an overly complex polysaccharide. For simplicity, it consists of galacturonic acid chain that is partially esterified as methyl esters and forming the pectin polymer that could have a molecular weight between 40,000 to 200,000. [1] The ester groups of pectin can react with primary amines to form amides. Furthermore, modified pectin could be cross-linked to develop micro-gel particles which are able to work as carriers of metal ions by further reactions. However, pectin molecule undergoes hydrolysis while dissolved in water and the degradation outcomes are pH dependent. [2]

To overcome the problem of pectin hydrolysis we have developed an original method for modification of pectin. The aim of the study was to successfully synthesis modified pectin with minimum water contact during amide formation with 1,4-Bis(3-aminopropyl)piperazine. Results obtained by NMR showed a successful substitution of 1,4-Bis(3-aminopropyl)piperazine with pectin while keeping the pectin molecules intact. As a result the water soluble pectin with a free amino groups was obtained which can be used to make stable micro-gels. A further reaction to cross-link pectin molecules to form micro-gel particles was made successfully resulted in stable solution under the desired pH level. This work and those results are the base for further development of micro-gel particles with abilities to perform catalytic reactions.

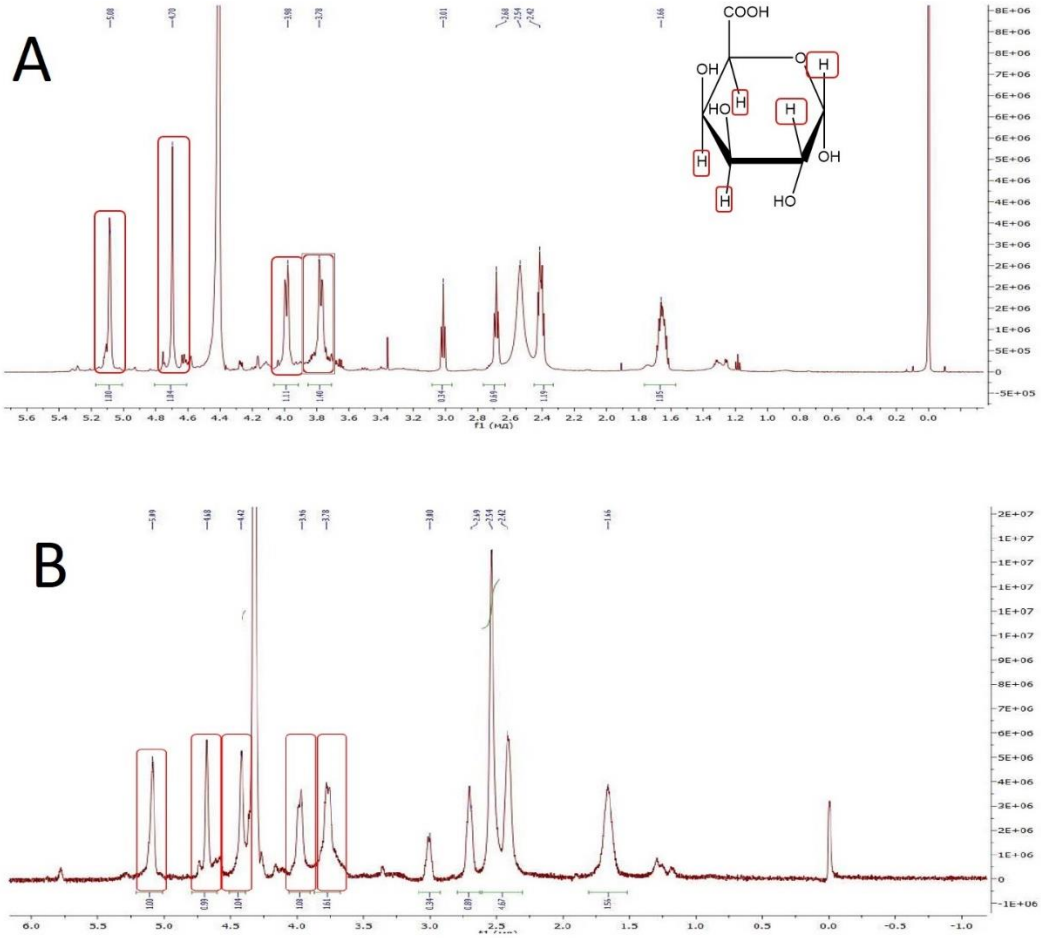

Рис. 1. NMR spectra of modified pectin showing the conversion of the starting material. A: 10 minutes reaction. B: 30 minutes reaction.

1. Henson, K. M., & Moeller, F. (2000). Pectin having reduced calcium sensitivity
2. Krall, S. M., & McFeeters, R. F. (1998). Pectin hydrolysis: effect of temperature, degree of methylation, ph, and calcium on hydrolysis rates. Journal of Agricultural and Food Chemistry, 46(4), 1311–1315.