FACTORS AFFECTING THE WATER CONTENT OF CALCIUM ALGINATE BEADS FOR AGROTECHNOLOGICAL PURPOSES

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The agricultural industry is facing decreasing availability of fertile soils and increasing water scarcity due to changing precipitation patterns as a result of global climate change. These challenges have led to the need to develop soil modifiers that, among other things, increase water retention in the soil, protecting crops from drought stress [1].

Alginate beads with a diameter of about 5 mm were synthesized by extruding sodium alginate solution into a calcium chloride mixture, which acts as a crosslinking agent. The concentration of polysaccharide varied from 0.5 to 3 % by weight, and that of calcium chloride ranged from 0.25 to 5 % by weight.

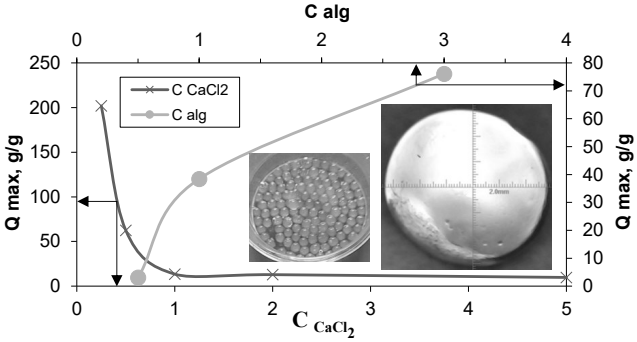

Fig. 1. Dependence of swelling degree of calcium alginate beads on the concentration of sodium alginate and calcium chloride. Inset: appearance of granules after synthesis and micrograph of swollen beads

As a result, it was found that an increase in alginate concentration leads to a significant (more than an order of magnitude) growth of the swelling degree, and with a rise of $CaCl_2$ concentration up to 1 %, the equilibrium water content of the gels decreases rapidly, remaining unchanged thereafter (Fig. 1). In addition, it has been demonstrated that competitive highly hydrophilic gels with good mechanical properties are formed based on alginate with medium viscosity (450–550 cP, Glentcham Life Science, provided that the concentration of polysaccharide and $CaCl_2$ is properly selected), whereas the use of alginate with low viscosity (4–12 cP, Sigma-Aldrich) in the entire concentration range of components studied produces only heterogeneous and fragile particles of nonspherical shape with a water-holding capacity that is ten times lower).

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1. Van der Merwe, R.d.T.; Goosen, N.J.; Pott, R.W.M. Macroalgal-Derived Alginate Soil Amendments for Water Retention, Nutrient Release Rate Reduction, and Soil pH Control. *Gels* **2022**, *8*, 548. https://doi.org/10.3390/gels8090548.