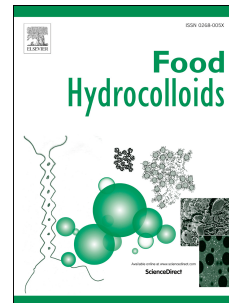


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1 Characterization of mechanical parameters of microbeads by means of 2 analytical centrifugation

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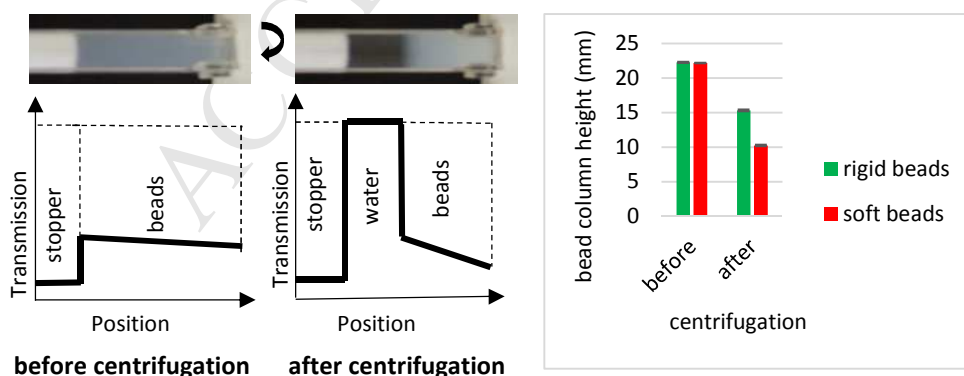
8 **Abstract.** Microcapsules, microspheres and microbeads are widely used in the food industry,
9 pharmacy, agriculture, cosmetics, construction, textile industry and printing to protect immobilized
10 substances against harsh conditions or to mask bad taste, as well as to enable and control the release
11 of substances e.g. active pharmaceutical ingredients. The knowledge of the mechanical properties is
12 a key parameter in development, application and control of processing. The paper focuses on the
13 experimental determination of the stiffness of alginate beads (about 400 μm) in terms of bulk
14 compressional behaviour by using a commercial available multisample analytical centrifuge
15 (LUMiSizer). The basic principle consists in applying an increasing centrifugal force on an alginate
16 bead column in a measuring cell and to record the height of the bead column (volume) in
17 dependence on the applied force during centrifugation. The packing/compression of beads is
18 quantified by the decreased column volume in relation to the applied force. It was shown that beads
19 made of alginate of high α -L-guluronic acid (G) content are more stable compared to alginate types
20 of high β -D-mannuronic acid (M) content. In contrast, gelling cations and their concentrations have
21 less influence on the mechanical behaviour. The described ensemble method is sensitive,
22 reproducible, easy to perform and, due to the simultaneous analysis of up to 12 samples, time
23 saving. The new method is especially suitable for quality control during microsphere production.

24

25 **Keywords:** microspheres, microcapsules, microbeads, compression behaviour, analytical
26 centrifugation

27

28 Graphical abstract



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