CALCIUM PEROXIDE (CaO_2) GRANULES ENCLOSED IN TEXTILE MATERIALS AS H_2O_2 DELIVERY SYSTEMS TO MITIGATE *MICROCYSTIS* SP.

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ABSTRACT

The past years, hydrogen peroxide (H_2O_2) has been introduced as an environmentally friendly method to combat *in-situ* toxic cyanobacteria blooms because of its selective oxidation and zero waste production. Treatment with H_2O_2 proved to be efficient for several occasions and blooming events as it selectively suppresses cyanobacteria by inhibiting their photosynthetic activity [1,2]. However, blooms of *Microcystis* sp. that were more persistent required higher H_2O_2 doses (> 7 mg/L) during treatment, doses that found to cause mobility issues to the zooplankton community of the aquatic ecosystem [3]. Calcium peroxide (CaO_2) granules are an alternative to liquid H_2O_2 due to their slow H_2O_2 release properties, simulating multiple H_2O_2 doses [4]. In this study, concentrations of 0.5, 1.0, and 2.0 g/L CaO_2 granules were (a) added into a surface water matrix to investigate their H_2O_2 releasing properties, (b) enclosed in four types of textile materials as delivery systems to evaluate their overall oxidant releasing capacity and (c) enclosed systems A – C were applied on a dense *Microcystis sp*. bloom to further investigate their suitability to combat cyanobacteria. No difference was observed between the maximum H_2O_2 concentrations of the direct application of granules and the fabric delivery systems of types A – C, which released up to 12 mg/L H_2O_2 from 2.0 g/L CaO_2 granules. Fabric system type D had the lowest H_2O_2 releasing capacity (2.0 mg/L of H_2O_2 from 2.0 g/L CaO_2 granules). Treatment experiments showed that granules enclosed in fabrics (GEF) type B of concentration 2 g/L and type C concentrations of 1 g/L and 2g/L were sufficient to reduce the photosynthetic activity of *Microcystis* species (<1000 RFU), proving that these delivery systems have the potential to become a more environmentally friendly alternative to H_2O_2. The process minimizes granules availability into the water matrix, and hence eliminate adverse impact on non-targeted species. Moreover, GEF systems promote circular economy by implementing practices that make use of reused and recycled fabrics.

KEYWORDS: calcium peroxide, granules, fabrics, oxidation, cyanobacteria

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