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Effect of zinc nitrate stress on growth kinetics and cell viability of *Saccharomyces cerevisiae*

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Zinc enrichment of *Saccharomyces cerevisiae* is a resource for obtaining biomass with higher nutritional value, provided that cells can tolerate elevated concentrations of the mineral. However, excess Zn^{2+} may induce oxidative stress and impair cellular functions. This study aimed to evaluate the growth kinetics of *S. cerevisiae* Y904 in YEPD medium (yeast extract, peptone and dextrose) supplemented with zinc nitrate, focusing on the identification of adaptive responses and their application in the production of zinc-enriched yeast. The experiment was conducted in a randomized complete block design, with three treatments (0, 1850, and 1855 mg L^{-1} of $Zn(NO_3)_2$) and four replicates. Cultivation was carried out at 30°C and 150 rpm for 5 h, with continuous monitoring of the growth rate (µmax) using a Cell Growth Quantifier. Cell viability was assessed at the beginning and at the end of the experiment. Data were analyzed using a linear mixed model with repeated measures and Tukey's test ($p < 0.05$). As a result, all treatments initially exhibited negative µmax values, which were more pronounced in the presence of zinc. Subsequently, growth recovery and stimulation were observed. The control reached a µmax of 0.231 h^{-1} at 1.5 h, while Zn1850 showed a peak of 0.224 h^{-1} at the same time point. The Zn1855 treatment exhibited a higher and temporally shifted peak, reaching a µmax of 0.332 h^{-1} at 2 h. Cell viability increased across all treatments, with final values of 93.7% ± 1.54% (control), 95.9% ± 1.41% (Zn1850), and 94.8% ± 1.53% (Zn1855), suggesting selection of more stress-resistant cells under Zn^{2+} stress. In summary, high concentrations of zinc nitrate induce an adaptive response in *S. cerevisiae*, characterized by initial growth inhibition followed by recovery and growth acceleration, reinforcing the potential of zinc nitrate supplementation for the production of zinc-enriched biomass.

KEYWORDS: Zinc biofortification, Stress response, Growth rate, Hormesis.

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