Improving ROS resistance in *Chlorella vulgaris* to increase biomass production

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Biomass from microalgae has gained increasing attention in recent years due to the many advantages over terrestrial crops. However, the economic feasibility of growing algae at an industrial scale is yet to be realized, in part due to biological constraints limiting biomass yield. A key issue is the inefficient use of light at high irradiances typical of photobioreactors' massive culture. In particular singlet oxygen ($^1O_2$) is an unavoidable by-product of oxygenic photosynthesis, causing photoinhibition and ultimately cell death. Thus, the successful implementation of biomass and biofuel production facilities requires the development of strains with increased oxidative stress responses and enhancement of detoxification networks. To this aim, we applied random mutagenesis and phenotypic selection to the fast-growing microalga *Chlorella vulgaris*. The organic dye Rose Bengal (RB), which generates singlet oxygen when illuminated, was added to the growth medium for the selection of $^1O_2$-resistant mutants. Three putative interesting strains were found, showing a higher resistance to $^1O_2$. Cultivation of these $^1O_2$-resistant strains in laboratory-scale showed higher productivity than the parental genotype, with a ~30% higher biomass yield in both dense cell suspensions and high irradiances, typical of industrial bioreactors. These results suggest that generation of mutants with higher resistance to ROS is a promising strategy in the development of domesticated microalga strains for mass culture.