Studies on the anti-aging properties of phycocyanin extract from *Arthospira platensis,* a cyanobacteria known as Spirulina

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We recently published that phycocyanin (PC), a phycobiliprotein which accounts for up to 20% of *A. platensis* dry weight, has a powerful anti-aging effect, greatly extending the chronological life span (CLS) of yeast cells, both under caloric restriction (CR) conditions (0.2% glucose) or under non-CR conditions (2% glucose). Interestingly, most of the aged PC-treated cells, which were unable to form colonies, were actually ROS+/PI– [Nova et al., Int. J. Mol. Sci. **2024**, 25, 4215]. Moreover, we showed that under CR conditions PC has an opposite effect, depending on the presence or absence of adenine in the culture medium, while PC extends the CLS of yeast cells grown under non-CR conditions, regardless the presence or absence of adenine in the medium (unpublished data).

With the aim to go deeper into the assessment of the anti-aging activity of PC under different nutritional conditions, we performed the CLS experiment in YPD, i.e. in a medium particularly rich in amino acids and peptides. Our results show that in rich medium PC has a toxic effect on cells, greatly decreasing the CLS, both when glucose is present at low (0.2%) or at high (2%) concentration. Interestingly, we showed that in YP containing 0.2% glucose, cells treated with PC show a lower level of ROS compared with untreated cells, while in YP containing 2% glucose is just the way around. These data suggest that *S. cerevisiae* could serve as a model not only to investigate the anti-aging properties and targets of PC, but also its potential side effects, possibly present in higher eukaryotic models under certain conditions.
To test whether PC could impinge on signal pathways controlling aging, we performed the CLS experiments using *ras2*Δ, *sch9*Δ and *snf1*Δ mutants. In particular, the Snf1 pathway is an anti-aging pathway, while the Ras2/PKA and the Sch9 pathways are pro-aging ones. Our results show that the anti-aging effect of PC was still evident in all the mutants we tested, indicating that the corresponding pathways are not involved in mediating the anti-aging effect of CP in yeast cells.
Finally, we studied the effect of PC on cell survival following an oxidative stress such as the treatment of cultures with hydrogen peroxide. Preliminary results show that after treatment with 3 mM H2O2 for 30 min at 30 C, PC treated cells showed a significant increase in cell survival when compared with untreated cells.