Anti-aging effects of plant extracts on eukaryotic models of Parkinson's disease

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Abstract: Plants are historically recognized as a source of bioactive molecules useful for several applications in the fields of medicine, cosmetics, and food industry. In recent years, the protective effects of these bioactive compounds have been highlighted on a wide variety of diseases among which diabetes, cardiovascular and neurodegenerative diseases (Pohl, F., et al., 2018).

Aging and age-related neurodegeneration are among the main challenges in modern medicine (Tripodi, F., et al., 2020) and Parkinson's disease (PD), which is associated to the misfolding of α-synuclein protein, affects about 10 million people worldwide (Oliveira, L. M. A., et al., 2021).

In response to the substantial waste generated by the conventional linear food industry, there is a growing emphasis on exploring alternative and environmentally friendly strategies to mitigate food waste. One such avenue involves the utilization of cocoa shells, a by-product typically discarded during the roasting process of cocoa beans (Pagliari, S. et al., 2022).

This study, developed in collaboration with the "ON Foods" NRRP project, is dedicated to unlocking the potential of cocoa shell components by investigating their protective effects and elucidating the underlying mechanisms that contribute to the prevention and inhibition of α-synuclein aggregation.

Moreover, to valorize the huge flora biodiversity, we report a screening on 63 endemic Italian plants, performed in the context of the National Biodiversity Future Centre – (NBFC), aimed to identify new plant-based bioactive molecules, considering their potential antioxidant, anti-aging and neuroprotective properties.

To find high added value in the extracts, eukaryotic cells expressing human α-synuclein have been used as a model of PD. By using budding yeast cells overexpressing human α-synuclein, we have assessed the effects on cell growth, cellular longevity and ROS levels, all phenotypes associated with α-synuclein-dependent toxicity. The most promising extracts are now under investigation for their effect on cellular metabolism and on the induction of catabolic processes such as autophagy and protein degradation.