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Proteomic analysis of radish seedlings to unveil biochemical events induced by sericin treatment

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Sericin, a protein produced during silk purification process, could represent a promising product for use in agriculture. Preliminary studies have revealed a positive effect of sericin on the growth of horticultural crops, such as lettuce and radish.

The aim of this study was to investigate by a proteomic approach the biochemical events occurring in radish (*Raphanus sativus* L.) seedlings treated with sericin (SER). The seedlings were grown in square plates, with their roots placed on two layers of filter paper soaked in a growth solution, either without sericin (C, control) or supplemented with 0.25% SER. After 9 days of growth under controlled conditions (16/8 h day/night cycle at 26/22 °C, 55/65% relative humidity, and a PPFD of 400 $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$), the seedlings were harvested. Compared to the C, SER-treated seedlings showed a 22% reduction in root biomass and a 115% increase in leaf biomass.

To obtain further information, total proteomes from both roots and leaves were analysed using GeLC-MS/MS (Gel Electrophoresis coupled with Liquid Chromatography-Mass Spectrometry). The proteomic analysis led to the identification and quantification of 195 proteins in roots and 160 in leaves. Among these, 26 root proteins (13%) and 15 leaf proteins (9%) showed significant changes in abundance compared to the C plants.

In roots, SER treatment appeared to decrease the abundance of proteins involved in NO_3^- and NH_4^+ uptake, as well as enzymes involved in nitrogen assimilation. Additionally, there was a reduction in key enzymes of the phenolic metabolism, including phenylalanine ammonia-lyase, a decrease in three plasmalemma aquaporins, and a notable increase in proteins related to biotic and abiotic stress. Overall, the leaf proteomic analysis indicated a positive effect of SER on photosynthetic capacity, along with a reduction in the glycolytic pathway.

Taken together, these results suggest that SER can fulfil the plant's demand for organic nitrogen, thereby reducing the need for nitrogen uptake and assimilation. At the same time, it appears to enhance carbon assimilation in the leaves. A potential beneficial effect on water plant status and on its defence response against biotic and abiotic stresses is also suggested.

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