

Tytuł projektu
Wpływ IAA-asparaginianu na modyfikacje potranslacyjne białek w grochu (<i>Pisum sativum</i> L.) w warunkach stresu abiotycznego
Project title
The effect of IAA-aspartate on post-translational modifications of pea (<i>Pisum sativum</i> L.) proteins during various abiotic stresses
Dyscyplina /Area of science
Nauki biologiczne
PROJECT DESCRIPTION
<p>Project goals</p> <ul style="list-style-type: none"> • To use biochemical and proteomic techniques (2-D electrophoresis, Western blot, UV-Vis spectrophotometry) to detect protein carbonylation and protein S-nitrosylation in pea during salt and temperature stress • To identify carbonylated and S-nitrosylated proteins • To verify hypothesis that IAA-aspartate modulates pea response to abiotic stress by post-translational modifications of some proteins <p>Outline</p> <p>Auxins are small aromatic amino acid-derived phytohormones (plant hormones) that regulate almost all physiological processes in plants. Thus, precise control of auxin concentration is required to maintain proper realization of plant physiology and plant responses to stress effectors. It should be noticed that most of auxin pool exist not as “free auxin” but as “auxin-conjugates” in plants. In pea, the major auxin, indole-3-acetic acid (IAA) is inactivated to IAA-aspartate (IAA-Asp) via ATP-dependent conjugation catalyzed by amidosynthetases from GH3 (Gretchen Hagen 3) acyl-adenylating enzyme family. Our previous investigations described the role of GH3 enzymes in IAA-Asp formation in pea. In contrast to other auxin-amino acid conjugate which can be hydrolyzed to free IAA, IAA-Asp is “not-hydrolysable” conjugate and acts as an intermediate in auxin degradation pathway. Our previous study showed that IAA-Asp affects some stress markers i.e. enhances post-translational modification (PTM) of proteins by carbonylation during salt stress in young pea seedlings. In addition, IAA-Asp modulated activity of antioxidant enzymes under salinity. These results suggest that IAA-Asp can be involved in pea responses to salinity.</p> <p>There is still no direct evidence that any IAA-amino acid conjugate acts as a signaling compound. However, to date no plant hormone conjugate has been used for proteomic studies. Detailed characterization of IAA-Asp-induced post-translational modifications of</p>

proteins will contribute to a better understanding of the molecular mechanism underlying the plant defense to abiotic stress effectors. Thus, these studies will be valuable for development of plant physiology and pathophysiology. This knowledge allows identification of new potential modulator of plant pathophysiology.

Work plan

1. Biochemical characterization of thiol-based redox homeostasis in pea seedlings treated with IAA-Asp during salt stress
2. Identification of S-nitrosylated proteins in pea seedlings treated with IAA-Asp during salt stress
3. Identification of carbonylated proteins in pea seedlings treated with IAA-Asp during salt stress
4. Effect of pretreatment of pea seedlings with exogenous NO donor (e.g. NaNO₂, S-nitrosoglutathione) and NO scavenger (cPTIO) on proteomic profile of carbonylated and S-nitrosylated proteins.

Literature

- Ostrowski M, Ciarkowska A, Jakubowska A (2016) "The auxin conjugate indole-3-acetyl-aspartate affects responses to cadmium and salt stress in *Pisum sativum* L. " *Journal of Plant Physiology* 191, 63-72

Required initial knowledge and skills of the PhD candidate

- ➔ Analytical thinking
- ➔ Eager to learn
- ➔ Understanding of biochemistry and plant physiology (plant hormones signaling,
- ➔ Knowledge about plant physiology, plant biochemistry, and molecular biology
- ➔ Eager to work hard

Zgłaszający projekt/ Author of the project

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Wydział Biologii i Ochrony Środowiska

jednostka organizacyjna

Proponowani promotorzy i mentorzy/prospective supervisors

1) promotor główny/ main supervisor

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Wydział Biologii i Ochrony Środowiska

jednostka organizacyjna

2) promotor pomocniczy / co-supervisor

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