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Determination and evaluation of acteoside content of *Scrophularia striata* Boiss. under Lead stress

Chaired by **DR. ALFREDO BERZAL-HERRANZ**;
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pharmaceuticals



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Abstract:

Scrophularia striata Boiss. (Scrophulariaceae family), as an important medicinal plant, is one of the species native to western Iran. This perennial herbaceous plant has been traditionally used to cure various diseases, including eye and ear infections, inflammation, infectious wounds, colds, and boils, and is also used to treat bacterial, fungal, and viral infections in the world. Since the COVID-19 pandemic outbreak, Ongoing efforts are proceeding worldwide to develop an efficient vaccine and use approaches to find preventive measures and effective treatment. *S. striata* was introduced as a phenylethanoid glycosides (PhGs) source. *S. striata* functions as a resistant plant under various stresses. The essential mechanism in response to abiotic and biotic stress is the production of phenolic compound precursors, which eventually leads to PhG compound accumulation, especially acteoside, in this plant. Acteoside operates as a powerful antioxidant that scavenges excess ROS content in biological systems. The study purposed to evaluate the acteoside content in response to Pb stress of *S. striata*. HPLC analysis was employed to identify PhGs between the untreated and Pb-treated shoots plants with three gathering times (24, 48, and 72 hours). Our results indicated that acteoside increased significantly after 72h under Pb stress, and no significant difference was observed in other time courses. In general, *S. striata* is a good source of PhGs, especially acteoside, with application in the pharmaceutical industry.

Keywords: *Scrophularia striata* Boiss., Phenylethanoid glycosides, Acteoside content, Pb stress.

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Introduction

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Ilam province and heavy metal pollutions

Ilam province, located in the west of Iran, is an area exposed to various metal mines and refineries, and the human health risk caused by heavy metals is increasing.



Dadkhah-Aghdash et al, 2022



Ilam and medicinal plants



Scrophularia striata

Ilam is a city rich in medicinal plants, and native inhabitants have traditionally used these plants.



Taxonomic name

Order:

Lamiales

Family:

Scrophulariaceae

Genus:

Scrophularia

Species:

Scrophularia striata

Local name:

Teshnehdari



Kerdar et al, 2018

<https://www.ncbi.nlm.nih.gov/data-hub/taxonomy/tree/?taxon=39249>

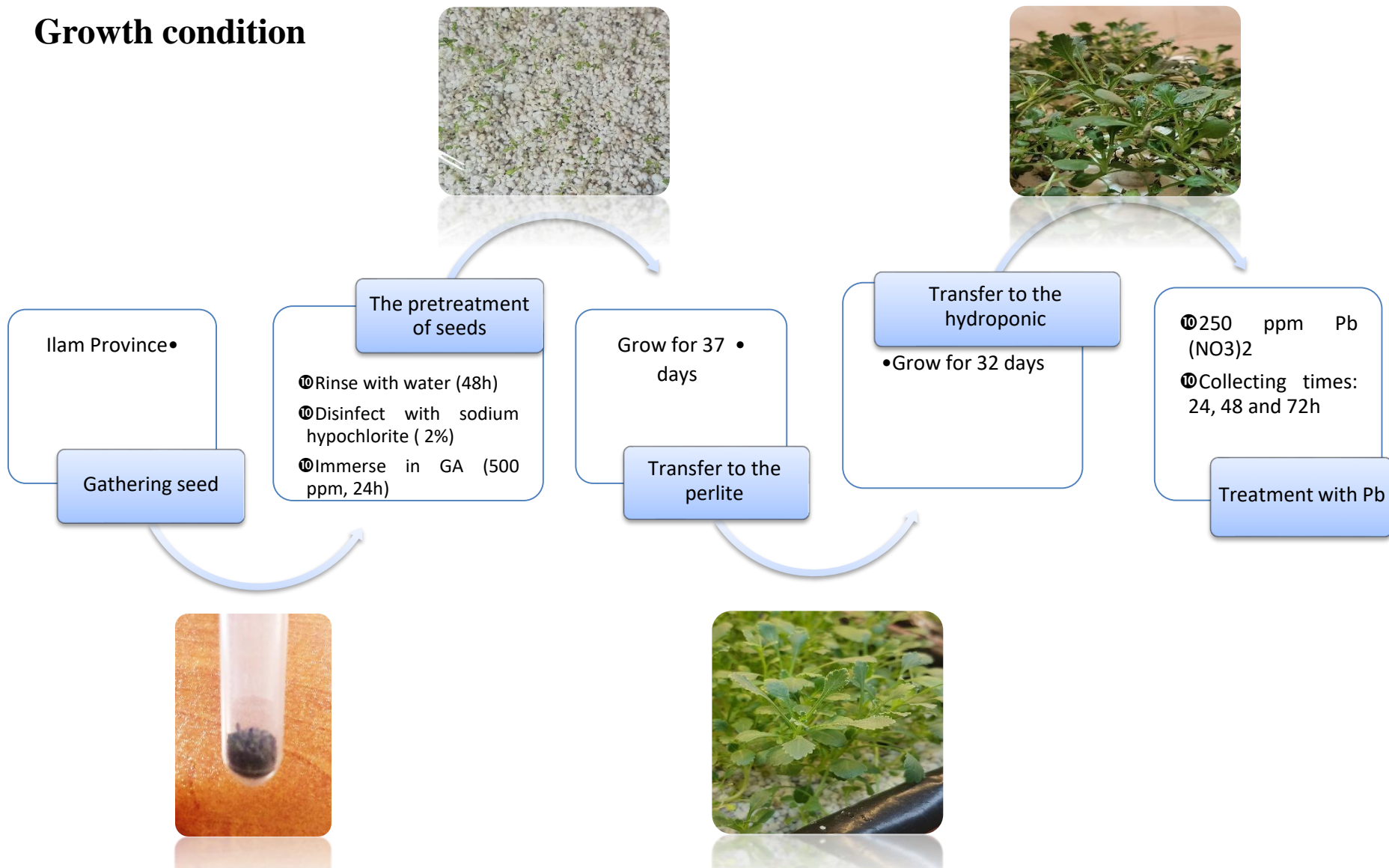
Methods

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Growth condition



Metabolite extraction and quantitative analysis of phenolic compounds

- ✓ 0.1 g of dried shoots were extracted within 4 mL methanol. after evaporation of solvent, the sediment was dissolved within acetonitrile, and extracted with n-hexane, the acetonitrile solvent dried. The sediment was dissolved in methanol (0.5 ml)



Owen et al, 2003

- ✓ The extracts were analyzed by HPLC (Agilent Technologies 1260 Infinity, USA)
- ✓ C18 column (Perfectsil Target ODS-3 (5 μ m), 250×4.6 mm; MZ Analysentechnik, Mainz, Germany).
- ✓ The mobile phases: solvent A: 2% acetic acid in water and solvent B: methanol
- ✓ detector (Agilent Technologies 1260 infinity, USA): at the 278-300 nm wavelength range

Zafari et al, 2016

Metabolite extraction and quantitative analysis of phenylethanoid glycosides

- ✓ 0.1 g of dried shoots were extracted within 4 mL methanol. after evaporation of solvent.
- ✓ centrifuged at 13,000 rpm for 20 min
- ✓ The sediment was dissolved in methanol (0.5 ml)



- ✓ The extracts were analyzed by HPLC (Agilent Technologies 1260 Infinity, USA)
- ✓ C18 column (Perfectsil Target ODS-3 (5 μ m), 250 \times 4.6 mm; MZ Analysentechnik, Mainz, Germany).
- ✓ The mobile phases: solvent A: 0.04% deionized water containing phosphoric acid; B:
Acetonitrile, flow: 1 mL per min
- ✓ detector (Agilent Technologies 1260 infinity, USA): at the 330 nm wavelength range

Beshamgan et al, 2019

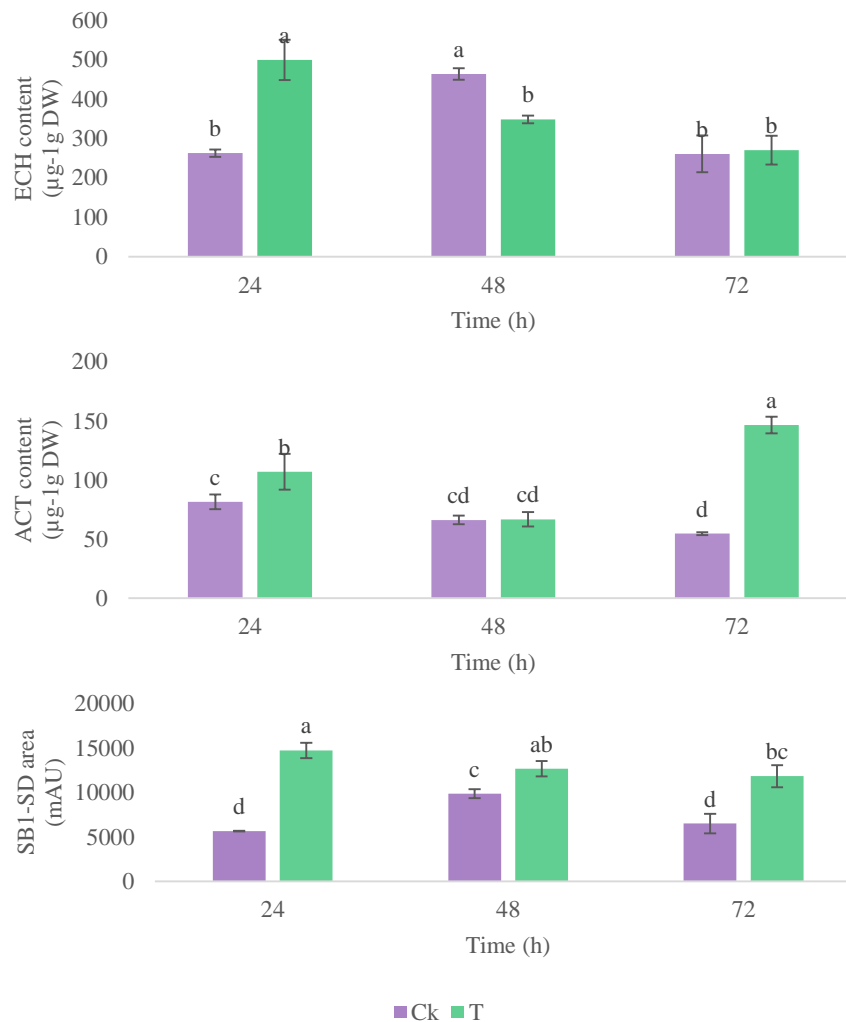
Results and discussion

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Results



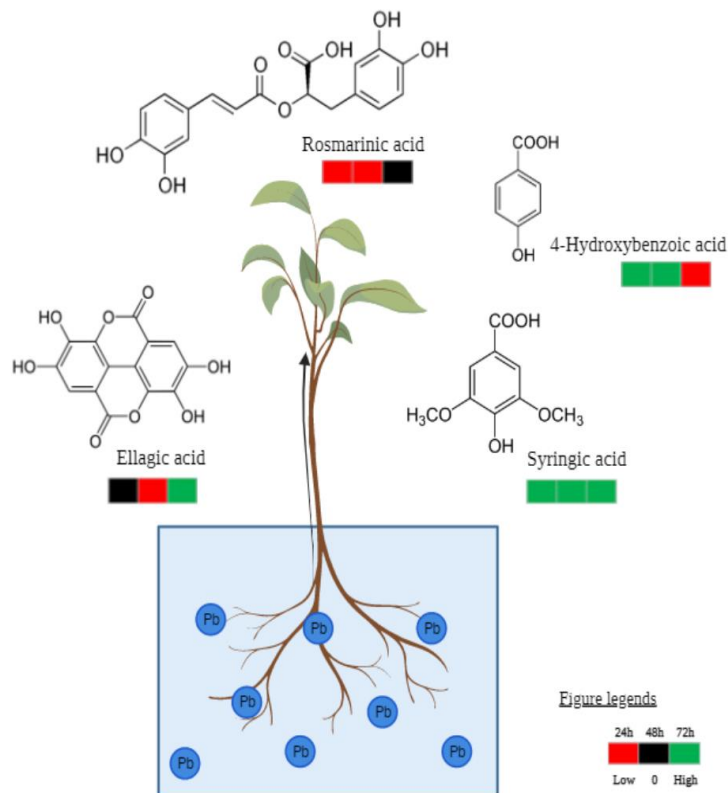
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Results

Pb element modulates phenylpropanoid compounds in *Scrophularia striata*. and changes the biosynthetic pathway of them.

- ❖ **Syringic acid** meaningfully increased in all Pb-treated plants.
- ❖ At 72h after treatment, **ellagic acid** increased
- ❖ At 72h after treatment, **4-hydroxybenzoic acid** reduced.
- ❖ **Rosmarinic acid** decreased under Pb stress and showed a significant reduction against CK samples.

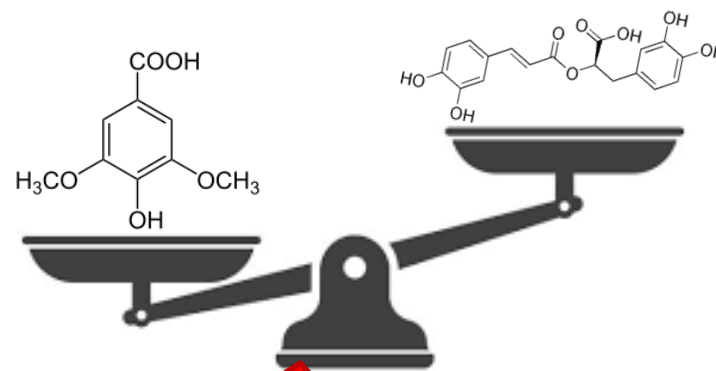


Discussion

On the base of our research, RA amounts were remarkably demonstrated and were similar to some of the Lamiaceae family species.

our results showed that RA was decreased in *S. striata* under Pb stress and a strongly negative correlation with the syringic acid.

Therefore, it can be stated that the defensive response changes of the plant are not in favor of the biosynthetic pathway of rosmarinic acid in the Pb stress and the biosynthesis pathway shifted toward the syringic acid biosynthesis pathway.



Pb stress

Conclusions

- ❖ The phenylpropanoid biosynthesis pathways shift toward modulation of their compounds, resulting in the change of their profiles in stresses.
- ❖ Overall, the observations suggest that aerial parts of the *S. striata* (Teshnehdari) Due to notably amounts of rosmarinic acid can be used in the food and pharmaceutical industries.

Teshnehdari

a valuable candidate plant



Conclusions

On the base of our research, **PhGs amounts** were **remarkably** demonstrated.

Our results showed that PhGs was **increased** in *S. striata* **under Pb stress**.

Biosynthetic pathway of PhGs is main pathway in different stresses in *S. striata* species.

Teshnehdari
a valuable candidate plant



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