

OPPONENT'S REVIEW

Doctoral dissertation of Mgr. Ensyeh Sarikhani

"Soil microbial communities in agroecosystems and natural habitats contributing to resistance and resilience of the soil environment. "

Potatoes are the third most important food crop around the world after rice and wheat. Although potatoes can be very easy to grow in different places, there are many diseases, pests and other issues which can affect potato growth. Common scab of potatoes is a soil-borne disease which is caused by the bacteria-like organism *Streptomyces scabies*. Despite attempts made over the past decades to elucidate the host-parasite and soil conditions interactions in the common scab disease of potatoes, it is still lacking a clear-cut picture of mechanisms by which the pathogen *S.scabies* is able to induce the development of this lesion in potato tuber.

This presented work successfully contributes to solving this problem and it is innovatively focused on a new perspective of possible protection of potatoes against this disease.

In my opinion, already the introductory work presented by the PhD. student (**Sarikhani, E.** et al.: The effect of peat and iron supplements on the severity of potato common scab and bacterial community in tuberosphere soil. FEMS Microbiology Ecology 93 (2016)) represents a new excellent view on this problem.

The thesis introduces an extensive overview of the results up to now, demanding experimental work with the latest technology and new results that are scientifically discussed.

Introduction covers most of works published in this area and analyzes current possibilities of passive and active protection of potatoes against targeted disease (disease management like use of resistant varieties, rotation of plants, adequate moisture and timing of irrigation, soil management, e.g pesticides treatment, etc.). Scope overview of background knowledge and critical view and their evaluation represent an excellent separate contribution to the introduction to this issue. The valuable conclusion from this part of the work confirms that the content of nutrients, especially Fe in soil and periderm, can play a significant role in the protection of potatoes against scab disease and confirmed the relationship between abundance of actinobacteria and the relation of dominant pathogenicity *txtB* gene. The student confirms this and further creatively demonstrates it in the next experimental part of the thesis.

However, the fundamental contribution of the thesis lies in an extensive and demanding experimental work. Thirty two sites located in different climatic areas in the Czech Republic were selected for monitoring of common scab disease severity. Iron- peat supplementation was selected based on significant differences in available iron content determined previously in the studied suppressive and conductive soils. Pot and field experiments have been carried out, mainly soil and skin analyses, 21 strains of actinobacteria were isolated from suppressive soils, samples of tubero-sphere and bulk soil culture were used for DNA extraction and quantifications were performed in real-time PCR.

Extensive and careful experimental work has made it possible to achieve valuable and new results:

Determination of biological and chemical factors associated with soil suppressivity to potato diseases was evaluated. Actinomycete population density and variety on the tuber surface were clearly reflecting difference between the susceptibility and resistant potato varieties. Effect of peat and iron supplements on the severity of potato scab and bacterial community in tuberosphere soil was elucidated. It was concluded that bacterial communities characterize a disease suppressive and conductive soil and interaction between isolated actinobacteria from suppressive soil and *S.scabiei*. Influence of the most important nutrients predicting the common scab severity has been also elucidated, as well as the effect of iron availability on potato common scab and tuberose bacterial community has been elucidated.

In my opinion, the most important conclusion is that the both, peat and iron supplements, controls potato common scab (CS), and reduces it the most effectively. The bacterial community was modified by all used treatments. It seems that iron supplement supports plant defense while both iron and peat additions changes the bacterial community in favor of scab suppression..

New scientific knowledge has been achieved, and the results of the thesis will be certainly successfully published in impacted journals. At the same time, this work could have a great economic potential not only in our country but around the world.

The work subject meets all the requirements obligatory for the doctoral thesis successful defense at the Charles University. I fully recommend it for defense.

I have no significant comments only a few questions to discussion

- Are there also other organic chelates Fe useful for suppressing toxicity of *S.scabies* and what is the effectiveness of organic chelates in comparison with synthetic chelates?
- What do you think about the role of elemental sulfur vs. lime sulfur in suppressing the scab?
- Do you think it is possible to completely exclude the application of synthetic fungicides or biofungicides (e.g. *Bacillus subtilis*) in the issue of scab diseases?

In Prague Jan 31st, 2020

prof. Ing. Kateřina Demnerová, CSc.