CHALLENGE OF PHYTOREMEDIATION SOLUTIONS IN PREVENTION OF DESERTIFICATION AND RELATED CLIMATE CHANGE PROBLEMS

Juris BURLAKOVS[1], Zane VINCEVICA-GAILE[2], Inga GRINFELDE[3], Jovita PILECKA[3], Maris KRIEVANS[2], Vita RUDOVICA[2], William HOGLAND[1]

[1] **Linnaeus University**, Department of Biology and Environmental science, Sweden
[2] **University of Latvia**, Department of Environmental science, Latvia
[3] **Latvia University of Life Sciences and Technologies**, Scientific Laboratory of Forest and Water Resources, Latvia

INTRODUCTION

Desertification is one of the major threats defined by the United Nations as it may affect humans and environment on a global scale; it is estimated that 10-20% of the total world surface is under the threat of desertification. Studies on effects related to desertification are important within the seeking of the ways to adaptation especially due to new blows induced by climate change that are turning the problem even worst.

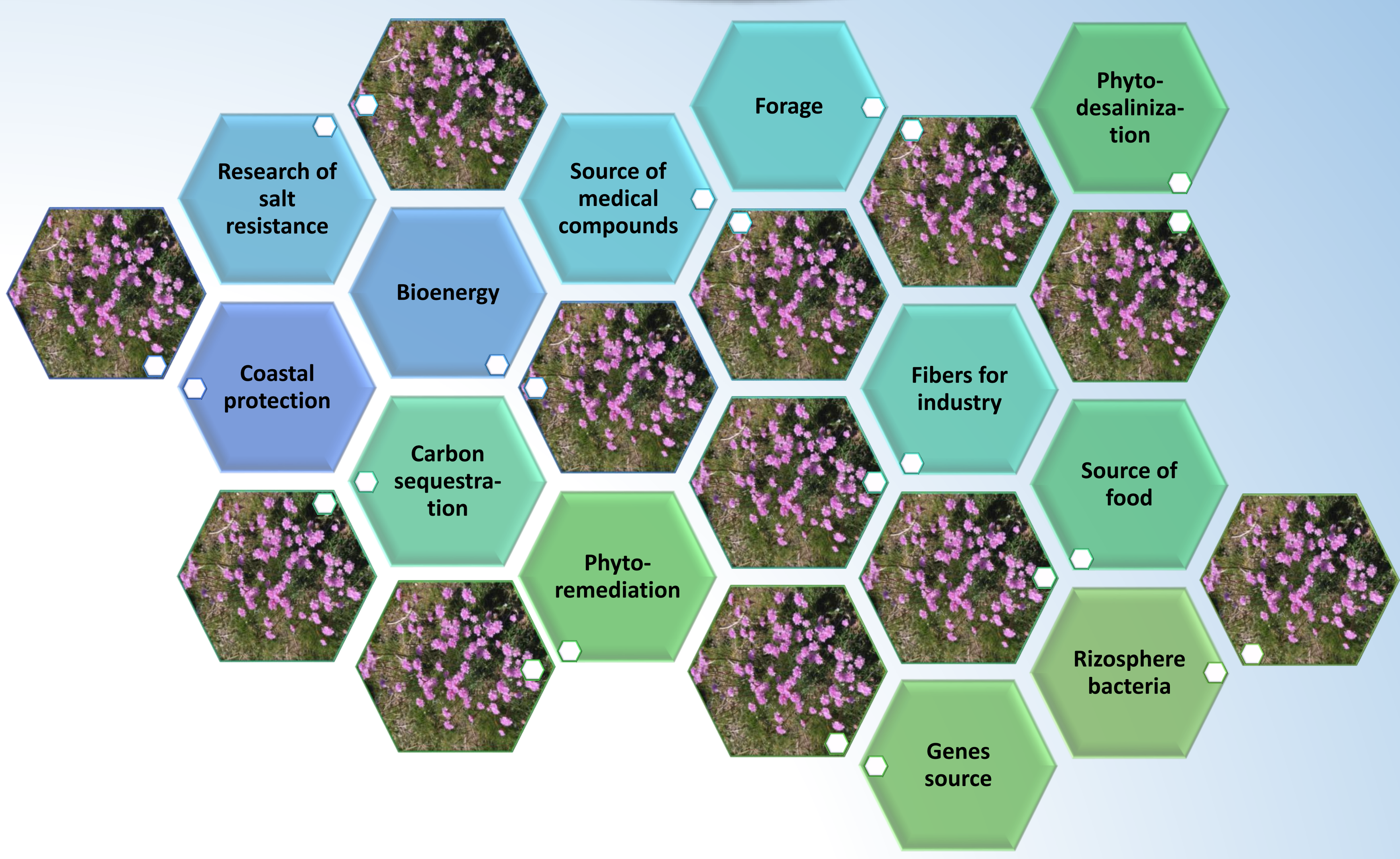
In the Southern Hemisphere (SH) oceans greatly prevail over surface terrestrial areas, however, climate change and localized desertification aerials significantly affect global temperature and precipitation as well as surface albedo. Biogeophysical mechanisms of land cover changes in the SH have been accounted for assessment of land management options, especially for latitude band over 15¼-30¼S. Desertification is responsible for negative impacts in more than 60% of the countries and one-third of the planet's land surface, threatening the environment and basic life needs of more than 1 billion people.

Desertification itself affects climate by means of biogeophysical processes – alteration of near-surface energy and moisture exchange, changes in atmospheric concentrations of greenhouse gases. Thus albedo, transpiration and surface roughness is reshaped and desertification intensifies even more influencing the climate change from local to regional and from regional to global scales. When forests become grasslands and grasslands transforms to semi-deserts and deserts, surface albedo is increasing and transpiration decreasing – it leads to expansion of desert aerial even more. These processes induced by humans via their lifestyles lead to climate change, and this dynamic system itself generates the feedback loop – decreased agricultural yields, less graze lands and simultaneously appears plethora of social and economic problems.

Series of modelling and studies have demonstrated the interaction between desertification and climate change. Climate simulations show increasing of surface albedo, decreasing roughness and soil water retention capacity, furthermore, desertification due to changed vegetation cover (or lack of it) is changing annual precipitation rates. There are indications that desertification may be linked with climate change in other parts of the world, particularly through the changes in sea surface temperatures - the oceans trigger climate variability in deserts. Desertification influenced by agricultural and urbanization activities are exacerbated by climate change is among the greatest environmental challenges of our times and if unsolved will lead to food security problems, poverty and lack of growth in developing countries. On the other hand, linear economy that demands more consuming for development promote environmental degradation, inappropriate land use, loss of biodiversity and rural restructuring.

APPLIED SOLUTIONS

Combating desertification and mitigating the impacts of climate change is the challenge that needs to act, and one of practical solutions as an example of adaptation is introducing the vegetation cover with specific plants that stabilize soil and diminishing forming of dust bowls that are removing the fertile soil and turning it into the desert as well as desalinating the soil in areas where precipitation is much less than evapotranspiration. The problems of soil salinity persist in more than 75 countries worldwide, and this problem is highly linked to desertification. Desalination of soils by halophytes was firstly suggested by ecologist and soil scientist H. Boyko in 1966. Approximately 1 billion ha of salt-affected areas are mainly located in drylands, including deserts and semi-deserts of the SH.



CONCLUDING REMARKS

Green remediation of these salt-affected soils might limit global water shortage crisis and improve the utilization methods of saline soils. For now, about 10,000 salt-tolerant plant species have been known to control soil salinity, and it is very promising approach versus expensive methods such as importing soil from somewhere. Green remediation of salt-affected desert soils by using halophytes of appropriate species helps this approach to be more efficient.

Moreover, urbanization, intensive agriculture, mining driven by economic development and population growth pose much more risks of anthropogenic desertification and salination. Species withstanding high levels of salinity and stabilizing the soil are important and the method is practically applicable for creation of buffer zones with vegetation in borderlands where desertification may be combatted one day.

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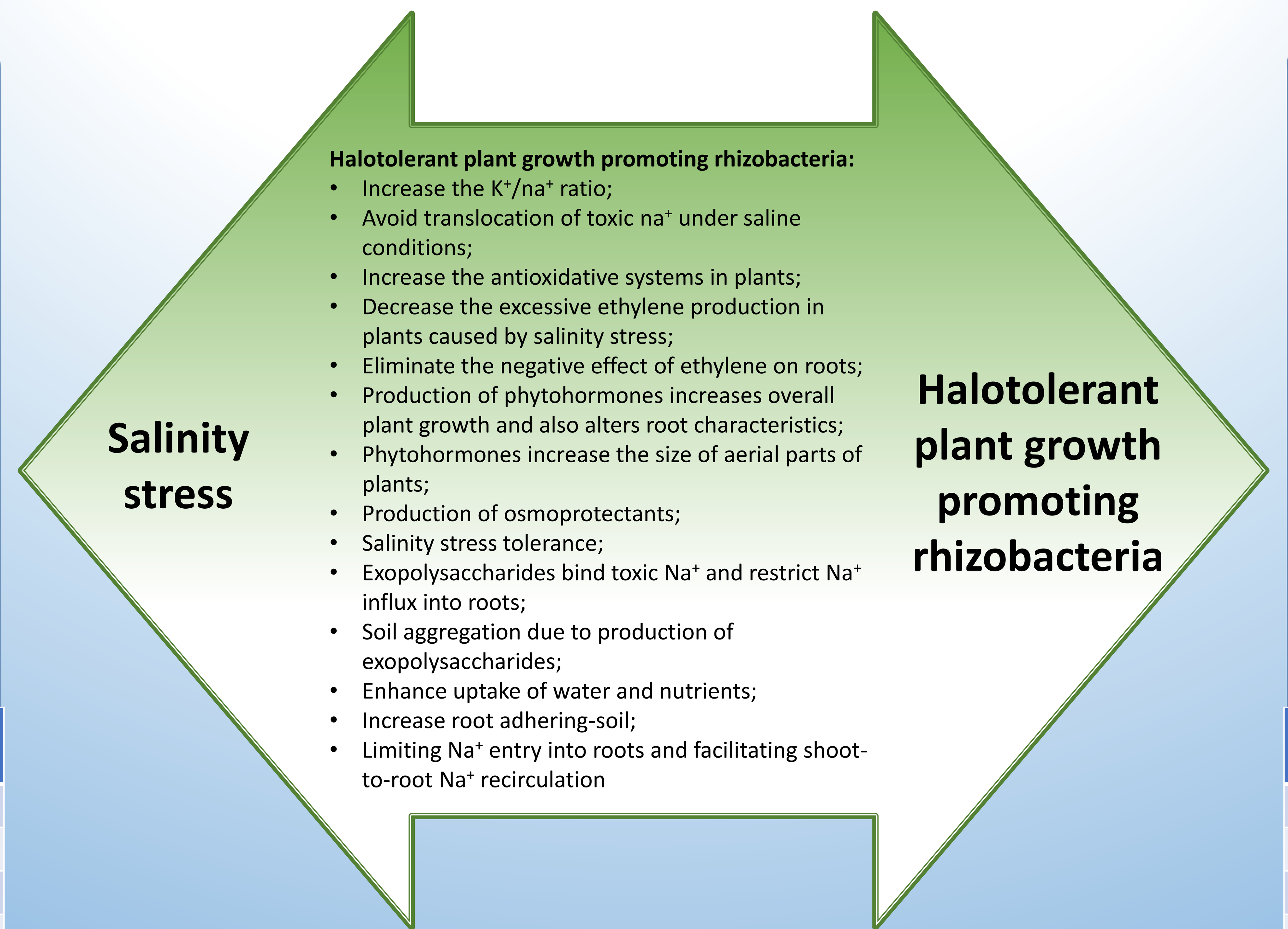
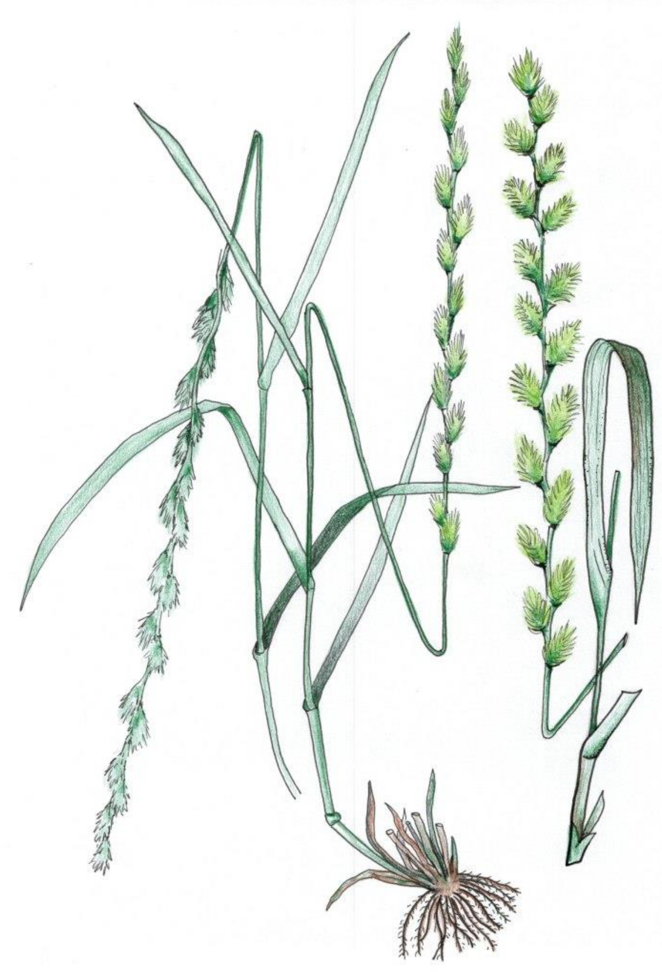
PRINCIPAL EXAMPLE

GLYCOPHYTE

Description	*Armeria maritima* (sea thrift)
Moisture	Dry
Soil	Sand, SALTY
Height	3-20 cm
Vegetation	Many seasons



HALOPHYTE



Description	***Lolium perenne* (perennial ryegrass)**
Moisture	Dry
Soil	Sand, COMPACT
Height	15-50 cm
Vegetation	Many seasons

Contact person: Juris Burlakovs
E-mail: juris@geo-it.lv

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