Global climate change and the rise of sea level. Are we returning to consumption of halophytes?

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Abstract

Statement of the Problem: Ongoing climate change within the 20th century results in the global mean surface temperature increase which causes melting of polar ice caps and rise of water level in oceans, by about 20 cm in the 20th century. The rise of sea level leads to flooding of vast territories, salinization of agricultural lands, shortage of freshwater and desertification. It is estimated that about 200 to 630 million people currently live in areas below high tides lines expected by 2100 under scenarios of low and high carbon emissions, correspondingly. The main source of the climate changes is activity of our growing human population leading to CO_2 and methane emissions by industry and intensive agriculture. Salinization of agricultural lands and expected migrations of populations may result in food insecurity promoting social disasters.

Methodology & Theoretical Orientation: The analysis of salinity tolerance of agricultural plants under increasing land salinization offers estimates whether the problem of food security under global climate change could be partially released. Introducing new plant species such as halophytes to agriculture is considered as a means to alleviate the expected malnutrition.

Findings: Essential rise of salinity tolerance in agricultural plants is achievable by means of modern tools of breeding and molecular biological intervention to plant genomes. The extreme case is the use of halophyte plants which are able to tolerate salinities above sea water (over 1 M NaCl) while providing stable production of biomass.

Conclusion & Significance: Though the undisputable only solution of global warming and its consequences is the abrupt decrease in emissions of greenhouse gases, still developing agriculture and new introduced species may provide certain buffering capacity to ensure global food security.

Recent Publications

1. Kulp SA, Strauss BH (2019) New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding. *Nat Commun.* 10:4844.
2. Flowers TJ, Colmer TD (2008) Salinity tolerance in halophytes. *New Phytol.* 179:945-963.
3. Volkov V (2015) Salinity tolerance in plants. Quantitative approach to ion transport starting from halophytes and stepping to genetic and protein engineering for manipulating ion fluxes. *Front Plant Sci.* 6:873.
4. Volkov V, Flowers TJ (2019) Mechanisms of Ion Transport in Halophytes: From Roots to Leaves. In: Gul B., Böer B., Khan M., Clüsener-Godt M., Hameed A. (eds) Sabkha Ecosystems. Tasks for Vegetation Science, vol 49. Springer, Cham. https://doi.org/10.1007/978-3-030-04417-6_10
5. Volkov V. (2022) System analysis of the fast global coronavirus disease 2019 (COVID-19) spread. Can we avoid future pandemics under global climate change? *Frontiers in Public Health* (endorsed by Reviewers).



Biography

Vadim Volkov has his main expertise in both theoretical evaluation and experimental research in membrane ion transport processes with accent on halophytic plants of highly saline environments. The expertise was built up over decades of experimental research in biophysics and biomedicine.

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