



Food and Agriculture
Organization of the
United Nations

PROCEEDINGS OF THE GLOBAL SYMPOSIUM ON SALT-AFFECTED SOILS

Halt soil salinization,
boost soil productivity

20–22 October, 2021



PROCEEDINGS OF THE GLOBAL SYMPOSIUM ON SALT-AFFECTED SOILS

**Halt soil salinization,
boost soil productivity**

20–22 October, 2021

Required citation:

FAO. 2022. *Halt soil salinization, boost soil productivity – Proceedings of the Global Symposium on Salt-affected Soils. 20–22 October 2021*. Rome.
<https://doi.org/10.4060/cb9565en>

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.

ISBN 978-92-5-136078-1

© FAO, 2022



Some rights reserved. This work is made available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo/legalcode>).

Under the terms of this licence, this work may be copied, redistributed and adapted for non-commercial purposes, provided that the work is appropriately cited. In any use of this work, there should be no suggestion that FAO endorses any specific organization, products or services. The use of the FAO logo is not permitted. If the work is adapted, then it must be licensed under the same or equivalent Creative Commons licence. If a translation of this work is created, it must include the following disclaimer along with the required citation: “This translation was not created by the Food and Agriculture Organization of the United Nations (FAO). FAO is not responsible for the content or accuracy of this translation. The original [Language] edition shall be the authoritative edition.”

Disputes arising under the licence that cannot be settled amicably will be resolved by mediation and arbitration as described in Article 8 of the licence except as otherwise provided herein. The applicable mediation rules will be the mediation rules of the World Intellectual Property Organization <http://www.wipo.int/amc/en/mediation/rules> and any arbitration will be conducted in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL).

Third-party materials. Users wishing to reuse material from this work that is attributed to a third party, such as tables, figures or images, are responsible for determining whether permission is needed for that reuse and for obtaining permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

Sales, rights and licensing. FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org. Requests for commercial use should be submitted via: www.fao.org/contact-us/licence-request. Queries regarding rights and licensing should be submitted to: copyright@fao.org.

Cover photograph: ©Matteo Sala

Introducing salt tolerant okra as a summer crop to coastal Lebanese area

Talal Darwish¹, Therese Atallah², Ali Fadel¹, Heba Kourani³, Ihab Jomaa⁴

¹ National Council for Scientific Research (CNRS), Beirut, Lebanon

² Lebanese University, Faculty of Agronomy, Beirut, Lebanon

³ Lebanese University, Faculty of Sciences, Beirut, Lebanon

⁴ Lebanese Agricultural Research Institute (LARI), Tal Amara, Lebanon

Keywords: summer vegetables, salinity management, salt tolerant crops, irrigation with saline water.

Introduction, scope and main objectives

Urban expansion and pressure on Mediterranean coast caused seawater intrusion into coastal groundwater, often used for irrigation of crops (El Moujabber *et al.*, 2006). Meeting the targets of the sustainable development goals requires the use of saline water for irrigation (Darwish and Fadel, 2017). Many growers fallow their land when EC_w reaches higher salinity values (7 dS/m). To reduce this livelihood loss, we introduced a salt-tolerant okra to the coastal Lebanese farming systems.

Methodology

The study area is located in Jieh at 23 km south of Beirut. The experiment was carried out in an open field on loamy soil for the summer growing season of 2019 (between May and September). Four water salinity treatments were considered with the electrical conductivity of the irrigation water (EC_w) comprised between 6 (T_c), 9 (T₁), 12 (T₂) and 15 dS/m (T₃). A total of 15 effective plants per treatment were selected for measurements. Crop performance of okra (PI 534521) was measured by non-destructive readings of the chlorophyll contents, canopy temperature and yield.

Results

As the salinity increased to 15 dS/m, chlorophyll contents significantly decreased as compared to T_c, T₁ and T₂ treatments. Okra canopy temperature in each treatment increased over time. At the beginning, canopy temperature was significantly different between all the treatments. At full harvesting, temperature in T₂-T_c, T₃-T_c, and T₃-T₁ was significantly different. Treatments T_c, T₁, and T₂ had maximum and similar yields throughout the study ($p > 0.05$), while T₃ fresh yield decreased by 60 percent with respect to other treatments.

Discussion

Chlorophyll content was affected by the highest salinity level (15 dS/m), which is beyond the threshold this okra variety can withstand. Salinity tolerance in okra varieties can be done in a short time, three weeks after the onset of salt exposure. This study suggests that yield of okra subject to increased water salinity did not differ from the control up to 12.4 dS/m, which is twice the average value recorded in the wells in Jieh. Beyond this level, okra yield was significantly affected by higher salinity. The form of the pods, being similar with the local variety, they will readily find access to the consumers' desire.

Conclusions

Salt tolerant okra can be grown on the Lebanese coastal area witnessing higher salinity levels of irrigation water. EC_w for this type of okra genotype should not exceed 10–12 dS/m. Moderate salinity did not affect okra pod quality nor yield. This provides one more opportunity to support farmer's income and encourage crop diversity on farmer's fields. For the first time, salinity tolerant genotypes were propagated and tested for salinity tolerance on the Lebanese coastal area and on farmer's fields.

Acknowledgements

This work is part of the IAEA Project RAS-5080. The project received financial and logistic support from the CNRS, LAEC and ARASIA Program.

The views expressed in this information product are those of the authors and do not necessarily reflect the views or policies of FAO.

References

Darwish, T. & Fadel, A. 2017. Mapping of soil organic carbon stock in the Arab countries to mitigate land degradation. *Arabian Journal of Geosciences*, 10(21): 474.

<https://doi.org/10.1007/s12517-017-3267-7>

Moujabber, M.E., Samra, B.B., Darwish, T. & Atallah, T. 2006. Comparison of Different Indicators for Groundwater Contamination by Seawater Intrusion on the Lebanese Coast. *Water Resources Management*, 20(2): 161–180. <https://doi.org/10.1007/s11269-006-7376-4>