

Long Term Impact of Salinity on Elite Date Palm Varieties from the Arabian Peninsula



The Arabian Peninsula boasts nearly half of the 105 million productive date palms worldwide.



The date palm is the ultimate sustainability crop for it has made life possible for millions of humans in adverse conditions, which earned it the name of "Tree of Life".

Thematic Area: Crop Productivity and Diversification

Purpose: Evaluate salinity tolerance among date palm varieties in the Arabian Peninsula and assess long-term impact of salinity on growth, productivity and fruit quality

Geographic Scope: Arabian Peninsula

Timeline: 2001 - Ongoing

Partner: Ministry of Environment and Water (MoEW), UAE

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The date palm (*Phoenix dactylifera* L.) is considered one of the most resilient crops in the Arabian Peninsula. Often referred to as the "Tree of Life" has been cultivated since ancient times, playing a pivotal role in the survival and everyday lives of indigenous populations. Its fruit, known as the date, is energy-rich, low in fat with a high nutritional value, containing vitamins A, B, and D. The date palm's economic impact on the livelihood of farmers and entrepreneurs in the region is immense; therefore, developing new stress-tolerant varieties and improving production and management techniques can in turn boost the entire agro-production system surrounding the date palm.

There are currently over 1,500 known date palm varieties and nearly 250 of those are produced in the Arabian Peninsula. Date palm is ranked among the highest of salt-tolerant plant species. However, information on the salinity tolerance of different date palm varieties is still relatively limited and only few studies have been conducted to evaluate the performance of date palm varieties under various saline conditions. Shedding light on the saline stress tolerance of the date palm could pave the way towards new varieties which can further improve outputs and livelihoods.

The International Center of Biosaline Agriculture (ICBA) in collaboration with the Ministry of Environment and Water (MoEW) launched two long-term experiments on the salt tolerance potential of elite date palm varieties. These experiments provided further concrete information and mapped the effects of salinity on the growth and production of date palm varieties in the Arabian Peninsula. In March 2011, ICBA research on the potential of Arbuscular Mycorrhizal Technology for Date Palms was recognized during the Khalifa Date Palm Awards when it was one of the eight winners chosen out of 131 regional and international participant. The research was awarded second place in the first category of Distinguished Research and Studies.

Activities and Outcomes

At the start of the project, in 2001 - 2002, a 2.5 hectare field was used to assess the long-term impact of different levels of irrigation water salinity on the growth, development, and production of several varieties of elite dates that are common in the United Arab Emirates (UAE).



Because of the date palm, human habitation have extended as far as it has into the hot and barren desert regions of the globe.

The objectives of the project were to:

- Evaluate salinity tolerance among elite date palm varieties in the Arabian Peninsula.
- Determine the long-term impact of different levels of salinity on date palm growth and productivity.
- Investigate the impact of irrigation water salinity on date palm quantity and quality.

The work was divided into two experiments:

Experiment 1 initiated in 2001, during which 10 varieties from the UAE (Abu-Maan, Barhi, Fardh, Jabri, Khalas, Khasab, Khnizi, Lulu, Naghal, Shahlah) were planted in a replicated field experiment at three salinity levels (5,10,15 ds/m) with five replications of each of the variety within each salinity level.

In terms of vegetative growth, results clearly showed that under the low salinity level applied in the field, varieties Lulu, Abu Maan and khasab had better growth in terms of height and stem diameter, followed by Khnezi and Jabri. While under medium and high salinity levels Abu Maan and Lulu were the best in vegetative growth, while growth of the variety khasab strongly declined, which suggests that this variety is unlikely to tolerate medium or high levels of salinity.

In terms of fruit production, results showed that the khasab, Lulu and Shahla were the highest in fruit yield under low salinity (34-43 kg/per plant), followed by Fardh and Khnezi varieties. Similar to the vegetative growth, at medium and high salinity Abu Maan and Lulu were the best in productivity, followed by Jabri and Barhi. Fruit yield of khasab fell sharply as in the case of vegetative growth and height, indicating

the high salinity sensitivity of the khasab variety. At the highest salinity level (16 ds/m) Barhi and Lulu were the most salinity tolerant.

Experiment 2 kicked off in November 2002 with 8 varieties from the Kingdom of Saudi Arabia KSA (Ajwat-ul-Madinah, Maktoumi, Nabtat Saif, Nabtat Sultan, Rhothan, Shagri, Sukkari and Um-Al-Hamam) planted in the same field using the same salinity treatments. The best performing varieties in vegetative growth and fruit yield were Sukkary, Ruthan and Shaqri, while Ajuat Al Maddinah growth and fruit yield improved substantially with age advancement. The other varieties were less adapted to the environmental conditions of the UAE and were low in growth and production regardless of salinity level.

During the two experiments a total of 270 plants (150 plants for experiment 1 and 120 plants for experiment 2) were used and there are already initial indications of varieties that fare better than others under saline stress conditions. This serves as a valuable starting point for further research and insight into this area.

Future Directions

The project is set for completion in 2015. Dissemination of project outcomes, results and information will be via extension and scientific publications. ICBA will also seek support for developing extension and outreach material for farmers on best management practices on cultivating date palms. In order to assess the long-term impact of increasing levels of salinity on date palm tree growth and productivity, monitoring and evaluation of the date palm field will continue.



Maintaining the date palm cultivation in the Arabian Peninsula requires alleviating the threat posed by salinity on the agricultural ecosystem.