

# Biosalinity News

## Newsletter of the International Center for Biosaline Agriculture

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### FROM THE EDITOR

The ICBA newsletter *Biosalinity News* is produced three times a year. Together with other ICBA publications, the electronic version of the newsletter is posted on ICBA's website [www.biosaline.org](http://www.biosaline.org).

In the first issue for 2004, our front page feature is on halophyte grasses for animal feed. Inside, the Focus on Salinity section describes salinity research in Oman.

As usual, there are also news items on projects in progress, workshops, networks and forthcoming events.

This newsletter is a forum for exchange of news and information among people interested in research and development activities in saline agriculture. Your input is welcome.

The Editor is pleased to receive short articles on research and development in saline agriculture that would be of interest to those involved in biosaline agriculture. We also welcome announcements of seminars, workshops, meetings and training courses, news of state-of-the-art saline agriculture, and relevant new publications. Please send your submissions to:

The Editor  
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## Learning to live with salt: halophyte grasses for animal feed

For many thousands of years, the tidal salt marshes in many parts of the world have been grazed by cattle and sheep. The grasses in tidal marshes and other saline regions have become highly adapted to salt water through natural selection. Such halophytic plants are widely distributed throughout the world, particularly in arid and semi-arid areas.

Recently, scientists in the United Arab Emirates have investigated the possibility of growing halophyte grasses as irrigated crops to provide animal feed. Scientists selected the most promising of these salt-tolerant or halophyte grasses, experimented with irrigating them with salt water, and have now come up with an intensive farming system which produces up to 45 tonnes of hay a year. Such systems can help farmers to maintain and improve the productivity of their farms even though their water supplies are becoming increasingly brackish or saline.

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*Distichlis spicata* and *Sporobolus virginicus* are halophyte grasses selected for salt tolerance and nutritional value



Management techniques—irrigation, application of fertilizer, harvesting—can improve yields of salt-tolerant forage production systems significantly



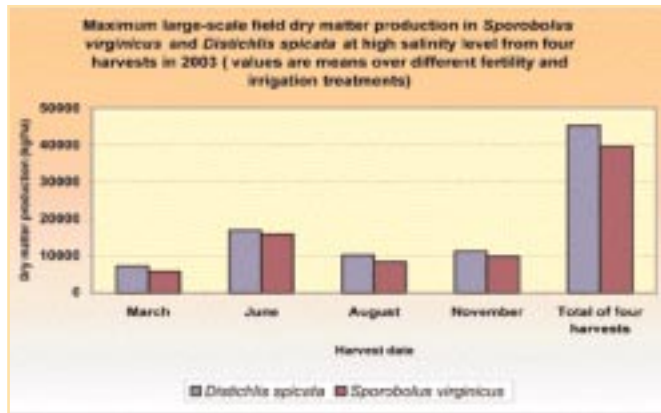
Suitability for mechanical harvesting was another important factor in selecting *Distichlis spicata* and *Sporobolus virginicus*



Both *Distichlis spicata* and *Sporobolus virginicus* are palatable to sheep and goats. Salt content remains low even at high salinities

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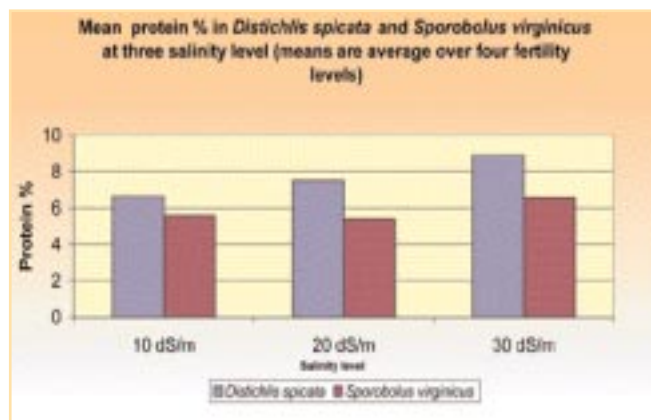


Biomass production of *Sporobolus virginicus* and *Distichlis spicata*

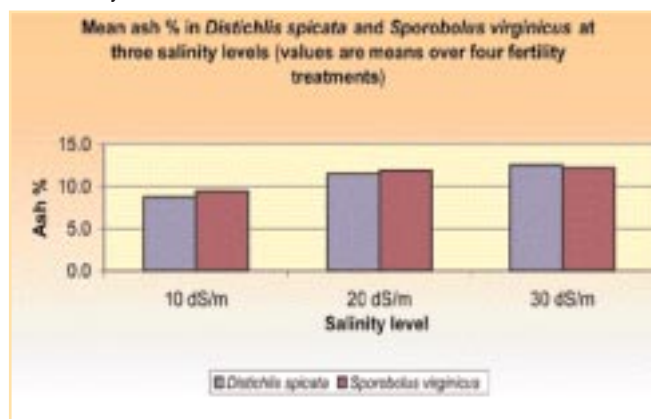
Initial trials in the late 1990s at the United Arab Emirates University, Al Ain, were promising. The halophyte grass *Sporobolus virginicus* yielded 17.5 tonnes per hectare in an irrigated system using highly saline water (30 dS/m, 20,000 ppm). The hay has been successfully fed to camels for five years. Subsequently, large-scale field trials were established at ICBA to develop a plant production system which would maximize productivity while maintaining sustainability.

The trials at ICBA completed in 2003 have shown that the halophyte grasses *Sporobolus virginicus* and *Distichlis spicata* can be adapted to intensive irrigated production. Yields were raised to 45 tonnes per hectare per year and a fully mechanised system for irrigation management, harvesting and baling was developed. Grass hay from the trials is now being evaluated for palatability and nutritional value in feeding trials with sheep and goats at the UAE University.

The next step is to take the production system to on-farm trials and to work with farmers to adapt the system to their needs. Farming production systems which enable



Protein percentage for *Sporobolus virginicus* and *Distichlis spicata* at three salinity levels



Ash percentage for *Sporobolus virginicus* and *Distichlis spicata* at three salinity levels

animal feed to be produced with salty water will help farmers worldwide who are affected by salinity or whose only water supply is salty water. Developing sustainable and productive management systems for naturally occurring halophyte grasses will help farmers to live with salt and allow them to continue farming, improve productivity and expand into marginal under-utilized salt-affected lands.

Further information: Dr. Ghaleb Alhadrami (hadrami@uaeu.ac.ae), Dr. Abdullah Dakheel (a.dakheel@biosaline.org.ae)

## On-farm trials at Ras Al Khaimah, United Arab Emirates

Agricultural expansion, depletion of groundwater and intrusion of seawater in the Northern Emirates have led to abandonment of farms because of increasing salinity. ICBA, in collaboration with the UAE Ministry of Agriculture and Fisheries, has developed a three-year project to demonstrate biosaline agriculture crops and management

techniques on a salt-affected farm in the Northern Emirate of Ras Al Khaimah.

Following installation of the irrigation and drainage systems, 70 genotypes of barley have been planted together with local and introduced varieties of *Cenchrus ciliaris* (buffel grass). Farmers will be invited to view the experiments in



The on-farm selection of salt-tolerant barley genotypes at Ras Al Khaimah, UAE

progress and learn about management techniques for irrigation with saline water.

## ICBA LINKAGES AND PARTNERSHIPS

### OPEC Director General Visits ICBA



*Dr. Suleiman J. Al-Herbish, Director General OPEC Fund for International Development, and Mr. Jamal Nasser Lootah, Assistant Undersecretary for Properties and Purchases, Ministry of Finance and Industries, UAE, tour ICBA accompanied by Dr. Abdullah Dakheel, Field and Forage Crop Scientist and Dr. Mohammed Al-Attar, Director General*

**D**r. Suleiman J. Al-Herbish, Director General, OPEC Fund for International Development, visited ICBA accompanied by Mr. Jamal Nasser Lootah, Assistant

Undersecretary for Properties and Purchases, Ministry of Finance and Industries, UAE, and Member of ICBA's Board of Trustees.

The OPEC Fund provided generous support to the Center during the construction of its facilities and subsequently during implementation of its technical programs.

Discussions covered the main activities of ICBA as well as the funds provided by the OPEC Fund to ICBA to cover the training costs of experts from around 30 Arabic and Islamic countries over the previous two years.

Dr. Herbish thanked the management and staff of the Center for the very impressive work they are doing to develop agricultural research in developing countries and added that the OPEC Fund, within the resources available to it, would spare no effort to continue supporting the Center.

### ICBA signs Memorandum of Understanding with ACSAD



**I**n February, ICBA and the Arab Center for Studies of the Arid Zones and Dry Lands (ACSAD), an applied research and development center located in Damascus, Syria, signed a Memorandum of Understanding (MoU) identifying scientific and technical areas of collaboration.

The MoU will facilitate the development of joint research projects on techniques for the utilization of saline water in agriculture in Arab countries.

*Eng Nouri Rahouma, Assistant Director General, Arab Center for Studies of the Arid Zones and Dry Lands (ACSAD) and Dr. Mohammad H. Al-Attar, Chairman of the Board of Directors and Director General, ICBA, signing the MoU in Damascus*

## INTER-ISLAMIC NETWORK ON BIOSALINE AGRICULTURE (INBA)

### Forthcoming course

The Nuclear Institute for Agriculture & Biology (NIAB), Faisalabad, in collaboration with IAEA is organizing an inter-regional training course on 'Mutation, biotechnology and screening techniques for tolerance to salinity', 26-30 April, 2004. The course will cover mutation, breeding, biotechnology, biochemical, physiological and molecular aspects of salinity, screening methods, control, irrigation etc., practical demonstrations on screening methods for salt tolerance, and a field trip to a saline experimental station.

Contact:

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### Hydrosalinity workshop

An international training workshop 'Hydrosalinity abatement and advanced techniques for sustainable irrigated agriculture' will be held 22-27 March 2004 at the Centre of Excellence in Water Resources Engineering (CEWRE), University of Engineering and Technology, Lahore, Pakistan.

The purpose of the workshop is to pool and share the experiences related to hydrosalinity in the Islamic world.

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### Workshop on reuse of marginal water in irrigation

INBA held a four-day Regional Training Workshop, 2-5 January, 2004, on 'Reuse of Marginal Water in Irrigation'. The workshop was held in collaboration with the Inter-Islamic Network on Water Resources Development and Management (INWRDAM), ICBA, the Organization of the Islamic Conference Standing Committee on Scientific and Technological Cooperation (COMSTECH), and IDB at ICBA.



Participants of the workshop on Reuse of Marginal Water in Irrigation at ICBA

### ICBA-NCARTT cooperative research in Jordan

ICBA and the National Center for Agricultural Research and Technology Transfer (NCARTT), Jordan, have begun a collaborative research project 'Expanding date palm cultivation under saline conditions in Jordan'.

The project will explore the potential for expanding the area of date palm cultivated in Jordan. Date palm is a high-value crop which is known to be salt-tolerant. Eighteen varieties of date palm will be tested for adaptation to saline soils at two locations in the Jordan Valley. At the same time, optimum practices for establishing date gardens on saline soils will be investigated.

The trials will serve as demonstrations for farmers, extension staff and researchers. The outcomes of the project will be recommendations of date palm varieties with adaptation to saline soil areas of the Jordan Valley and appropriate irrigation management systems.

## RESOURCE MOBILIZATION

### Progress on design of multi-country salt-tolerant forage project



*ICBA scientists meeting with farmers in Kasilian, Pakistan*



*Project design meeting with partners in Tunisia*



*Discussing a prospective research site with a farmer in Oman*



*Discussing on-station experimental plots in Jordan*



*Salsola propagation for rangeland rehabilitation in Syria*



*Project design meeting with Jordanian and Palestinian scientists*

Forages irrigated with saline water can play a crucial role in growing crops on marginal lands and rehabilitating rangeland ecosystems. Animal feed produced by irrigation with saline water could lead to sustainable agriculture on marginal land and rangelands and provide additional income to poor farmers.

ICBA is leading the development of a multi-country, multi-donor project proposal to grow forage with saline water on marginal land in the West Asia and North Africa (WANA) region. Following consultations with senior scientists from Jordan, Palestine, Pakistan, Syria, Tunisia and Oman during a two-day workshop at ICBA, in June 2003, ICBA scientists travelled to Jordan and Palestine (January 2004), Pakistan (December 2003), Syria (February 2004), Tunisia (January 2004) and Oman (December 2003). The visits sought inputs and assistance in developing the proposal from national scientists and institutions. ICBA scientists visited prospective research sites in national institutions and farms in each country.

The International Fund for Agricultural Development (IFAD) provided ICBA with US\$21,000 for design work following acceptance of the concept note for entry into the IFAD pipeline for financing.

The design work was undertaken to ensure that the proposed research activities relate directly to the livelihood strategies of the poor.

Potential crops for each country and potential sites were identified and partners agreed in principle on the scope and extent of project activities. However, priorities in each country still need to be determined and much remains to be discussed and agreed with partners on the detailed plans and implementation. The final decisions on implementation at different sites and the sequence of testing of species will be only be taken in the project initiation meeting once financing is assured.

## FOCUS ON SALINITY

### Oman: Review of Ministry of Agriculture and Fisheries salinity research

Dr El Amin Abdulmajid El Amin, Senior Scientist Soil Chemistry, Dr Saleem Kaseemsaheb Nadaf, Senior Seed and Plant Genetic Resources Scientist, Dr Hamid Ali Al Cheloub, Field Crops Expert, Mr. Nasser Salem Al-Uhaibi, Researcher, Soil Chemistry, Mrs. Safaa Mohammed Al-Farsi, Researcher, Seed & Plant Genetic Resources, Mr. Saleh Ali Hinai, Researcher, Seed and Plant Genetic Resources and Saif Ali Al- Khamisi, Researcher, Field Crops, Ministry of Agriculture and Fisheries

The Agriculture Production Research Center (APRC), Ministry of Agriculture and Fisheries, at Rumais has been active in research on the use of saline irrigation for agricultural production for more than a decade. It has tested the productivity of vegetable, oilseed and forage crops under different salinity levels and irrigation regimes, and identified salt-tolerant cultivars and management practices for saline environments. The feed and forage species tested include sorghum, barley, wheat, fodder beet and a number of indigenous forage grasses.



Identification of salt-tolerant cultivars of wheat at the Agriculture Production Research Center, Ministry of Agriculture and Fisheries, Oman

Experiments have been carried out on cyclical irrigation of vegetables and wheat with saline and fresh water. In the first year, 1:1 irrigation with fresh water and saline water (6 dS/m) was carried out on tomato and no significant difference was observed in productivity compared to irrigation with fresh water. In the second season, 1:2 irrigation with fresh and saline water (7-8 dS/m) is being tested on tomato and 1:1 irrigation of wheat.



Salt-tolerant wheat genotypes have been evaluated for response to five salinity levels (2, 4, 8 and 12 dS/m)

Fodder beet (cvs Peramono, Anissa and Petra) has been shown to produce yields of 80-100 t/ha of green matter (foliage and tubers) in 70 days under saline irrigation (5 dS/m). Yields with saline irrigation water were higher than yields (70-80 t/ha green matter) of the same cultivars with fresh water irrigation (2 dS/m). Another two cultivars - Jamon and Wintergold - yielded 74.5-77 t/ha.

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Fodder beet has been shown to produce 80-100 tons per hectare green matter under saline irrigation at 5 dS/m

All five cultivars tested showed good adaptation to Oman conditions. Different irrigation systems have been tested and drip irrigation was shown to be the most efficient.

Germplasm collection in Oman was initiated in 1984 in collaboration with the International Plant Genetic Resources Institute (IPGRI) and the Food and Agriculture Organization (FAO). In addition, the germplasm collection contains 83 accessions of alfalfa, approximately 100 of wheat, 20 of barley, 20 of chickpea, and a small number of accessions of fenugreek and coriander. Later collecting missions were undertaken in 1998 when 68 accessions of pasture species were obtained under the Arabian Peninsula Research Program (APRP) of the International Center for Agricultural Research in Dry Areas (ICARDA). Between 2001 and 2003, a further 60 accessions of pasture species from the north, 35 accessions of pasture species from the south, and 31 species of medicinal plants were also collected.

Thirteen salt-tolerant wheat genotypes were evaluated for response to five salinity levels (2, 4, 8 and 12 dS/m) from 1996 to 1998. Consistently high tolerance to salinity was found in S-24 from Pakistan and Sids-6 from Egypt.

In collaboration with APRP, indigenous species have been evaluated under salinity in comparison to the widely cultivated forage grass *Chloris gayana* or Rhodes grass. *Coelachryum piercii* was found not to be tolerant to salinity. Rhodes grass was more salinity tolerant and more productive than *Cenchrus ciliaris*. *Panicum turgidum* and *Lasiurus hirsutus* are currently being evaluated for salinity tolerance. Experiments were also carried out on seed production of indigenous grasses *Panicum turgidum*, *Lasiurus hirsutus* and *Cenchrus ciliaris*. Harvesting within 1-2 weeks after physiological maturity was found to give the best yields of good quality seed for all three species. Morphological characterization of the accessions of indigenous forage grasses is also being carried out.

In the area of crop production, a number of different winter and summer crops are being studied. In wheat, hybridization between introduced and local varieties has been carried out and the semi-dwarf progeny are being selected for tolerance to rusts and smuts as well as acceptable bread making quality. Selection among local barley cultivars for performance under salinity has resulted in one local variety - Duraqui - being identified



Canola has been found to be suitable for conditions in Oman



Canola has been tested for performance under salinity during two seasons

as having superior salinity tolerance. Canola has been studied during two seasons of testing and been found to be suitable for Oman conditions. Among summer crops, a number of forage sorghum hybrids introduced from Australia (Pacific Seeds) have been tested in several locations around the country and found highly productive over eight cuts. One genotype was found to give more than 80 t/ha of green matter in eight cuts at Sohar Research Station over a period of approximately 16 months. The same materials will be tested under salinity. A diverse set of 67 sorghum genotypes has also been obtained from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) for testing and some varieties showed promise.

## CAPACITY DEVELOPMENT

### ICBA and University of Sydney offer partial scholarship for MSc in Sustainable Agriculture

In collaboration with the University of Sydney, Orange, Australia, ICBA is offering a partial scholarship for entry to the Master of Sustainable Agriculture at The University of Sydney, Orange.

The Master of Sustainable Agriculture is designed to enable the student to meet the challenges of the future by equipping them with the necessary skills to balance the natural resource, human and economic factors that affect agricultural sustainability. The underlying concept of the program is to meet the needs of the present generation without compromising the needs of future generations.

The scheme provides one scholarship each year for on-campus or distance study commencing in March or July.

The value of the scholarship amounts to nearly a half of the tuition fees for the complete Masters course.

Details of the scholarship and an application form are posted on ICBA's website [www.biosaline.org](http://www.biosaline.org). Applicants will have to provide evidence of their English language skills to meet University admission requirements together with details of their ability to pay the remaining half of their tuition fees, and travel and accommodation expenses for the on-campus study option.

### Joint ICBA-AREO workshop

In collaboration with the Agricultural Research and Education Organization (AREO), Teheran, Iran, ICBA will convene a workshop on 'Principles and Application of Biosaline Agriculture in Arid and Semi-Arid Regions with Reference to Iran,' 14-15 April 2004.

The Bank of Keshavarzi and the Iran Ministry of Agriculture will also participate. ICBA and AREO will make technical presentations during the two-day workshop.

## FORTHCOMING EVENTS

### ICBA case study at Association of Applied Biologists Centenary Symposium, London in March

Prof. Dr. Faisal Taha, Director Technical Programs, International Center for Biosaline Agriculture (ICBA), has been invited to participate in the international symposium 'Increasing the effectiveness of world public sector agricultural research through partnerships: bases for novel paradigms' to celebrate the Centenary of the Association of Applied Biologists in London, UK, 10-11 March 2004.

Prof. Taha is among 20 eminent scientists from around the world invited to make presentations on specific topics of global importance. The symposium will include vital contributions from distinguished members of academia focusing on means of ensuring the future provision of scientists to deliver and communicate the knowledge and know-how required to under-pin the future development of world agriculture.

Using case studies from a wide range of world agricultural environments, the speakers will discuss their individual experiences and perspectives and present innovative visions on aspects of collaboration and participatory scientific research. Prof. Taha will present a case study on participatory research entitled 'Supporting research for the development of innovative, sustainable agricultural systems using saline water'.



*Prof. Dr. Faisal K. Taha, Director Technical Programs, ICBA*