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Palm Leaflets for Water Desalination

English: Love at Second Sight

Beneficial Effects of Finger Millet
on Anaemic Girls

Sustainability through Reuse
Centre





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Sultan Qaboos University

دائرة العلاقات العامة والإعلام
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On Track

A recent economic study published by the Middle East Institute in Washington has praised the model of economic transition management being pursued by the Sultanate in an effort to attain economic welfare via combining free trade and attracting foreign investments. Themed "Oman's Transition to a Post-Oil Economy: Arching toward Asia", the study points out that the Sultanate continues to tackle regional and international economic challenges particularly in relation to oil price slump. The study adds that the Omani economy has returned to growth that drives Oman to harder and faster toward a post-oil economy.

The study states that back in 1995, following a decade of fiscal deficits and weak oil revenues, Oman was the first GCC country to draft a long-term development strategy in the form of a "Vision" document. Oman launched Vision for Oman's Economy 2020, a roadmap for transitioning from a hydrocarbon economy, unleashing the private sector, and creating a broad industrial base. The current 9th Five-Year Development Plan (2016–2020) emphasizes the need to accelerate diversification by targeting five sectors for development: manufacturing, tourism, transport and logistics, mining, and fisheries.

In an effort to address the challenges associated with achieving the objectives of the 9th Five-Year Plan, the Sultanate created the National Program for Enhancing Economic Diversification (Tanfeedh). The study states that with the adoption of the Tanfeedh program, Oman embraced the opportunities presented by developing itself as a key logistics hub in the Middle East. The study further says that the development of Duqm Port and Special Economic Zone in Duqm (SEZD) is at the forefront of Oman's efforts to transition to a post-oil economy.

Considering the global economic conditions, economic diversification is crucial for Oman. The diversity of its natural resources presents the Sultanate a unique competitive advantage in regional and global markets, as well as an opportunity to achieve its economic diversification objectives. Above all, recent increase in crude oil prices is a positive in terms of economic recovery in the Sultanate.

A Journey towards Accreditation

The College of Economics & Political Science (CEPS) at Sultan Qaboos University is undergoing accreditation assessment by the European Quality Improvement System (EQUIS). EQUIS is the leading international system of quality assessment, improvement and accreditation of higher education institutions in management and business administration. EQUIS has established its prestige and recognition worldwide and has accredited the top 1% – 174 institutions in 41 countries – since its launch in 1997. CEPS at SQU decided to go for EQUIS accreditation and got the membership in 2015. The eligibility for accreditation was granted in 2016. So far, the College fulfilled implementation of EQUIS standards and completed preparation of self-study reports.

Dr. Rafi Asharafi, EQUIS Project Leader at the College of Economics & Political Science at SQU, said that the final phase of the accreditation process is the Peer Review Team's visit to the College for the final peer review meeting, which was held from 25 to 27 September 2018. "As part of the review program, the EQUIS Peer Review Team members met and interviewed a wide variety of staff and students from including SQU top management, the college executive team, faculty group members, staff from support service units and student representatives. In addition, they met a variety of stakeholders including representatives from the corporate sectors, advisory board members and the alumni", he said. On the first day of the review program, the team interviewed the top officials of the university administration including the Vice Chancellor,

the Deputy Vice Chancellors and the Assistant Vice Chancellor.

Dr. Rafi Asharafi further said that the college decided to undergo EQUIS accreditation to ensure a rigorous quality control, benchmarking the college against international standards in terms of governance, programs, students, faculty, research, and internationalization. "Accreditation by a reputed international agency like EQUIS ensures responsibility and sustainability, as well as corporate engagement of the institution. EQUIS covers all academic programs offered by a college", he noted. He said that EQUIS accreditation has had a positive influence on the quality assessment and improvement of business schools. The former management education editor of the Financial Times in the UK recently stated that EQUIS is now regarded as "the gold standard" for international business school accreditation.





Dr. El-Said I. El-Shafey
Chemistry Department
College of Science

Date Palm Leaflets for Desalination of Brackish Water

Ion exchange is a promising technique for desalination. Ion exchangers have the ability to completely desalt and purify saline water especially at low and moderate salinity levels. Date palm leaflets can be utilized as a precursor for a series of ion exchangers for desalination of brackish water.

The Sultanate of Oman is among semiarid countries with annual average precipitation of approximately 100 mm/year indicating limited renewable fresh water resources with ground water representing around 87% of water resources. In Oman, the agricultural activities consume ~ 92% of fresh water resources, 37 % of which comes from Al-Falaj system and 59% comes from ground water wells. However, salinization is progressively taking place in groundwater along the coastal areas of Al Batina region, turning the fresh water wells to brackish. The deficiency in the aquifer caused by over-pumping of groundwater led to seawater intrusion that was noticed since 1970s and therefore the groundwater becomes brackish. Soil salinity is considered as a major threat to crops production. It affects vegetation at all stages of plant growth including germination, seeding, vegetative and mature stages because of osmotic affects (dehydration), ion toxicity and nutrition imbalance. High concentrations of salts in soil decrease the infiltration and percolation rates leading to water deficiency and limiting the growth of plants. Recent analysis of brackish water showed considerable high levels of cations, particularly sodium, calcium and magnesium, and anions: chloride and sulfate with Total Dissolved Solids (TDS) levels exceeding 15,000 mg/L in some wells causing detrimental effects to plant growth and soil fertility. TDS of less than 3000 mg/L is the maximum limit for general irrigation.

Desalination technologies, such as thermal and membrane technologies, are based on the separation of saline water to both fresh water and brine water. Thermal processes separate salt form water by heating, evaporation and condensation of the saline water to form fresh water such as Multi-Stage Flash Distillation

(MSF), Multiple Effect Distillation (ME) and Vapor Compression Distillation (VC). However, they are costly and energy consuming. Membrane desalination technologies include reverse osmosis (RO), electrodialysis (ED) and nano-filtration (NF), among which RO is most used globally. However, membrane technologies are energy intensive and suffers membrane fouling and scaling. It is still expensive for some farm owners to install such technology in their farms.

Ion exchange is another promising technique for desalination. Ion exchangers have the ability to completely desalt and purify saline water especially at low and moderate salinity levels (brackish). Date palm is an important commercial crop in the Sultanate of Oman with around 180,000 tons of date palm leaflets produced annually. This agricultural byproduct is considered as a waste with little or no use.

At the Department of Chemistry, College of Science, SQU, a team consisting of Dr. El-Said I. El-Shafey as the principal investigator, Dr. Bushra Al-Wahaibi as co-principal investigator and Dr Saleh Al-Busafi as a member, is working on a research project. In this project, date palm leaflets are utilized as a precursor for a series of ion exchangers for desalination of brackish water. Date palm leaflets were first converted to dehydrated carbon that is prepared in one step via acid dehydration process. Dehydrated carbon is loaded with high content of carboxylic groups ($-\text{COOH}$) that act as centers for surface tailoring and functionalization. Using polyamine reagents, chelating ion exchangers with chemically immobilized amine groups were prepared. They show outstanding capability for calcium and magnesium removal from brackish water. Those chelating ion exchangers act as anion exchangers at low pH

values such as pH 4 or 5. At these conditions of pH, anions such as Cl^- , SO_4^{2-} and NO_3^- are removed efficiently. Sodium ion removal from brackish water is challenging because it does not chelate easily like calcium and magnesium. Thus, another strong cation exchanger was successfully prepared with immobilized sulfonic groups on its surface ($-\text{SO}_3\text{H}$) that dropped sodium levels efficiently. On combining both types of ion exchangers (anionic and cationic) in a filter, efficient desalination of brackish water was achieved as both cations and anions were successfully removed until the filter capacity was reached. Reuse of palm leaflets based ion exchangers was successfully carried out for 4 cycles without a decrease in the desalination efficiency.

Some of those research findings were presented in an invited talk in the 7th international conference of ion exchange (ICIE2018) that was held in Yougyakarta, Indonesia (10-13 Sept 2018). The date palm leaflets based ion exchangers produced in this project are efficient for desalting, recyclable, cheap and sustainable as they depend mostly on local resources. They can not only treat brackish water but also can be combined with desalination techniques such as reverse osmosis to decrease the salt stress on the membrane and to prevent scaling, thus, improving the life time of these membranes.

The main long-term objective of this project is to produce a prototype filter from date palm leaflets based ion exchangers for the filtration of brackish water to produce fresh water suitable for irrigation. In this research, two master students have successfully graduated (Abdullah Al-Ghawi and Asmaa Al-Harhi) together with some final year project students and some research articles are to be sent for publication.

ENGLISH

Love at Second Sight

Ghadeer Marhoon Al Mamari

"A teacher? Are you serious? Why do you want to be a teacher?" "It is a tiring career. Although you will have a good salary, it is not worth it?" "Besides, the country does not need any more teachers. You won't get employed." These are some of the words that are meant to smash my spirit intentionally or unintentionally. They are designed to make me change my mind and give up on my dream of becoming an English language teacher. For some students who wish to become teachers, these words are able to blurry their future vision. For me, NEVER. I used their heat to purify my soul of any doubts about my future dream: Ghadeer Al Mamari, English Language Teacher.

Ironically, some years ago, such comments would have their intended impact on me. When I was five years old, my parents decided to do their best for my education. Realizing the importance of English language in the job market, they decided to send me to a bilingual kindergarten outside my village. My every day trip in the bus took around one hour every day. Adding to that the torture of being the first to ride the bus in the morning and last to leave it at the dead heat of noon time.

"Why I have to go to this kindergarten? "Why can't I study with my friends in the village?" The response was always the same "It is a bilingual kindergarten" and "It is better for you." I did not blame my parents for this daily torture, but I blamed English language. English was the root of all evil in my life, but I have to learn because my parents said it was good for me.

After two years in the kinder-

garten, my parents took on the themselves the responsibility of teaching me English at home during grade one, two and three. The public school system in Oman only offered English classes starting at grade four. My parents were adamant at teaching me English and I was adamant to please them by beating the devil.

I finally joined the promised grade four. It was a battle field for me. Some of my class mates took their early grades in private schools and their English was good compared to the rest of the class. The teacher did not bother to teach anyone. She was so busy showcasing these private school students in front of the class. They were asked to write the letters and numbers, spell the words and sing the English songs in front of us. We were forced to be a passive audience. I felt angry that the one thing I spend many years to acquire and beat is now used against me and against my poor colleagues. It is used to beat us all, to make us inferior. I wondered why our teacher does not understand that we have different levels of proficiency? Why is she discriminating between us? Why are we punished because of English language? It hurts me so much to recall the time and efforts my parents put into my education and now it is not recognized by my fourth grade teacher. The same story was repeated again and again from grade four to grade seven.

Grade eight brought me the gift of a good teacher. A teacher who was bewildered at the lack of basic foundation skills in English among majority students. This teacher started teaching us the basics of English. She was communicating with us. She

was recognizing us. She understood that we were not the same. This treatment created a shift not only in my attitude towards English as a language but also towards teaching and the role of teachers in facilitating the students' acquisition of English language.

I had a plan to prove this shift in my feelings towards English language. I decided to be in charge of my learning. I studied grammar. I spelled words and sentences. I read them outload. I wanted English to become my voice to tell the teachers who did not bother teaching me and my colleagues, who discriminate against us that I can beat you using English. The same language you used for years to beat us and to discriminate against us.

Today, I look back at my experience of learning English and I feel proud that this very unpleasant experience created a shift in my thinking. Today, I am proudly majoring in English Education. Today, I am looking forward to join the troops of the good English language teachers. I promise that I will never discriminate between my students. To those who are still wondering why I want to become an English language teacher, I say to them loud and clear: "I am in love. I am in love with English at second sight."

Ghadeer Marhoon Al Mamari is a student in the Department of English at the College of Arts & Social Sciences at SQU.



Dr. Suja Karkada
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Beneficial Effects of Finger Millet on Anaemic Girls



Adolescence is a period of transition from childhood to adulthood and is characterized by spurt in physical, emotional and mental growth. Due to the physical development, anemia (blood Hemoglobin value less than 12g%) is considered to be a condition among girls in many developing countries across the world. The prevalence of anemia among adolescent girls ranges between 20-80% in different parts of India. I was interested in conducting research studies on anemia among the rural adolescent girls. During a preliminary survey of 410 adolescent high school girls, the prevalence of anemia was 57.3% in the rural schools of Udupi district in Karnataka state.

Hence, a research study was conducted to find the effectiveness of a nutritional supplement in improving the hematological parameters (Hemoglobin (Hb), red cell distribution width (RDW), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC)), scholastic performance and body mass index among mild anemic adolescent high school girls were conducted.

Ragi (finger millet) contains 72% of carbohydrate, is rich in calcium and protein and has good amount of iron and other minerals. It is low in fat most of which are unsaturated fats. The grain actually originated in Africa and has been cultivated in Uganda and Ethiopia since many years Although India produces 58% of its global production, very few Indians know about ragi, its health benefits and nutritional value.

This quasi-experimental study was conducted in selected high

schools in Udupi district in India located in semi-rural settings. Ethical permission was obtained from the ethical committee of the hospital and university as well as informed consent from parents and assent from adolescent girls prior to the study. After preliminary survey to measure hemoglobin (Hb) levels at the selected schools using cyanmethemoglobin method, the experimental group consisted of anemic adolescent girls with Hb levels ranging between 10 and 11.9 g% (Group1). As recommended by ethics committee, the control group had normal Hb levels ranging from 12 to 12.5 g% (Group 2). These girls were selected based on the preliminary survey. On the day 1 the adolescent girls were screened for all the parameters. Each group comprised of a total of 30 girls and hence the total was 60.

Girls from group 1 were collected in a classroom along with their mothers to explain about the research study. A total of 5 kg ragi flour (divided into two packs on day 1 and day 45) was given to each adolescent girl, and the preparations of the ragi porridge was demonstrated to their mothers and were advised to provide the porridge to their daughter's every day for 90 days. On Day 1 the BMI and scholastic performance were assessed. The scholastic performance was the percentage of the scores obtained by the adolescent girls in the examination prior to data collection. A blood sample was collected for analysis of hematological parameters. The researchers followed both groups up to their homes on Day 45 and 90 for data collection. On day 45 & 90, their blood was collected to monitor the improvements in the hematological parameters. The demographic characteristics

of the two groups show that most of the adolescent girls belonged to the age group of 13–14 years (76.7%, 63.3%) with normal BMI (60%, 56.7%) in group 1 and group 2 respectively. In group 1, there was an improvement of Hb to normal levels among 80% of the mild anemic adolescent girls. Incidentally, about 20% of the adolescent girls with normal Hb in group 2 regressed to mild anemia by the end of the study. Further, the results shows improvement in the Hb levels in the intervention group, from a mean of 11.3 g% on Day 1 to 12.54 g% (Statistically significant) on completion of 90 days of intervention. This helped me to explain that consumption of ragi porridge daily for 90 days was the reason for the improvement in their hemoglobin levels. In comparison, the slight change in the values of hemoglobin levels from 12.21 g% to 12.71 g % observed in group 2 was not statistically significant.

Even though there was a statistically proven difference of hemoglobin, there was no statistically significant difference between Day 1 and Day 90 with other hematological parameters like MCV, RDW, MCHC and MCH. The effect of ragi supplement on BMI and scholastic performance was also not statistically significant.

The results of this study have indicated that Finger Millet (ragi) can be supplemented in the diet of adolescent girls with mild anaemia to improve their Hb levels. In order to ensure better outcomes, nutrition education of mothers is further recommended as a strategy to improve their compliance to dietary supplementation to their adolescent girls.



Sustainability through Reuse Centre

Sultan Qaboos University and Oman Environmental Services Holding Company (be'ah) are involved in a mutually beneficial partnership that will strengthen the 'green campus' mission of the University. The cooperation program aims to promote the strategic goals of be'ah with regard to achieving landfill diversion and promote circular economy initiatives across the Sultanate of Oman, through the establishment of a Reuse Center. The long-term objective of be'ah is to create sustainable waste management solutions and drive a conscious habit to nurture a sustainable future. In this interview, Eng. Tariq Al Amri, Chief Executive Officer of be'ah talks in detail about be'ah's initiatives towards building a sustainable future in general and about the Reuse Centre to be set up at SQU.

Since its inception in 2009, how far be'ah has achieved its goals?

Eng. Tariq: be'ah had a successful history with its various accomplishments with regard to applying sustainable waste management strategies. Our first priority was to control the damage caused by more than 300 traditional open dumpsites scattered across the country and the bad practices in waste handling. We closed over 200 dumpsites in the past few years and replaced them with 8 engineered landfills and 13 transfer stations. Our goal is to close all dumpsites and replace them with a total of 11 engineered landfills and 18-25 transfer stations. The waste management services was outsourced to the private sector in order to collaborate towards joint responsibility in conserving Oman's environment.

We also started providing treatment services for healthcare waste in 2012 and our services are currently covering over 99% of healthcare waste generated in Oman. As for Industrial Waste, be'ah is working towards expediting the establishment of the treatment facilities, which will enable be'ah in providing integrated services as per international environmental standards. Our company has set an ambitious target to reduce amount of waste going into landfills by diversion rate of 60% moving towards 80% by 2030. This can be accomplished via the implementation of various waste diversion projects that aim at recovering energy from the currently landfilled waste. Partnering with the government, private sector and

citizens, be'ah is committed to creating a waste management eco-system which will contribute to the nation, its people and serve as a benchmark in the region.

Could you comment on the proposed Reuse Centre to be set up at SQU premises?

Eng. Tariq: As part of its sustainable waste management strategies, be'ah focuses on forming a pre-disposal waste diversion mindset among the public by promoting the concept of 3Rs 'Reduce, Reuse & Recycle'. The plan for establishment of a joint 'Reuse Center' in collaboration with Sultan Qaboos University (SQU) is in line with this strategy. By setting up the Reuse Centre at SQU we explore opportunities to promote its sustainable development culture and practices within the campus community.

According to the outcomes of the meeting held with SQU on 30th May, 2017, it was agreed that this initiative, which will be the first of its kind in the entire GCC region, will encourage university staff and students to be actively involved in waste reduction and minimization activities. The Reuse Center will provide environmental, financial, economic and social benefits for all stakeholders involved and will become a centralized hub promoting sound environmental practices across the country.

Could you explain the scope of work of the proposed Reuse Centre?

Eng. Tariq: The Reuse Center will be built and located in SQU. The project will include

construction and design of the Reuse Center which will comprise of item receiving and sorting areas, item repair facilities, item display area and staff offices. The Center will be managed by joint team from be'ah and SQU and will be run and operated by a third party. SQU staff and students will be encouraged to donate reusable items to the Center and to volunteer working at the Center and participate actively in SQU's strategy for promoting sustainable development practices. The community too, are encouraged to donate items to the Reuse Center either directly or through charity organizations.

In what way, you think, that the Reuse Centre would be of benefit to SQU?

Eng. Tariq: In line with SQU's drive towards sustainability and environmental stewardship, the Reuse Center will be of utmost importance to facilitate sustainability goals of the University. All departments within the campus have surplus items that are either kept, stored or disposed of. The 'reuse seed' if planted at SQU, will present an initial move towards sustainability on campus, which will grow into an integrated web-like flow of items throughout the university and beyond into the community.

With effective campaigns, social media initiatives and awareness programs, the impact of the reuse activities within SQU will promote nation-wide practices of reuse and waste prevention.



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