Objet :	RE: Article submision for "Arab World Water"
De :	Dana Hani (d.hani@cphworldmedia.com)
À :	souguir_2004@yahoo.fr;
Date :	Mardi 9 décembre 2014 14h18

Dear Dr. Dalila,

Thank you for submitting the below article. It will be considered for possible inclusion in the Arab Water World March issue, which will be featuring a topic on “Irrigation Technology.”

Could you please provide me with the high resolution images found in the word document?

Thanks in advance.

Best Regards,

Dana Hani

Assistant Editor & Researcher

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From: Dr. SOUGUIR Dalila [mailto:souguir_2004@yahoo.fr]
Sent: Tuesday, December 09, 2014 1:10 PM
To: CPH Marketing; CPH Info
Subject: Article submision for "Arab World Water"

Dear Editor of the Magazine of "Arab World Water",

We hereby submit an article entitled "**Alternative valorization of salt-affected soils by cosmetic plant: *Aloe vera"*** by "Dalila SOUGUIR and Mohamed HACHICHA **"** to be considered for publication in “Arab World Water”. The article encloses the main text and 7 photos.

Thank you for receiving our paper and considering it for publication. We appreciate your time and look forward to your response.”

Sincerely,

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Alternative valorization of salt-affected soils by cosmetic plant: *Aloe vera*

Dalila SOUGUIR and Mohamed HACHICHA

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Salinization problem

The phenomenon of salt-affected soils occurs in all continents and under almost all climatic conditions. Their distribution, however, is relatively more extensive in the arid and semi-arid regions compared to the humid regions, where rainfall dissolves these salts and sweeps them to the sea, through streams and rivers. Where rainfall is sparse or there is no quick route to the sea, some of this water evaporates and the dissolved salts become more concentrated. In arid areas, this can result in the formation of salt lakes, brackish groundwater, salinized soil, or salt deposits.

Most of the salts are added with the irrigation water and left behind in the soil as water is removed by the crop. These may accumulate and reduce the availability of soil water to the crop. To avoid salt accumulation to an excess level, they must be removed in amounts about equal to the salts applied (salt balance concept). To dissolve and remove the salts, large (and generally unavailable) amounts of water must be used to leach away the salts before conventional crops could be grown. However, there may be useful salt-tolerant plants that can be grown on these soils without this intervention. And although the introduction of salt-tolerant plants will not necessarily restore the soil to the point of growing conventional crops, soil character is often improved and erosion reduced.

With a saline and brackish groundwater at shallow and intermediate depths, a salinity problem may also exist due to upward movement of water and salts from the ground water. In Tunisia, the combination of water quality and agricultural practices (e.g., cultivation techniques, crop management, irrigation) has affected soil resources, and about 30% of irrigated areas are affected by salts in different degrees (Hachicha, 2007). The salt content of soils above which plant growth is affected depends upon several factors, among which are the texture of soil, the distribution of salt in the profile, the composition of the salt, and the species of plant.

Water scarcity

In addition to soil resource problems, in many arid and semi- arid regions of the world, water is becoming an increasingly scarce resource, added to its poor quality. With a per capita freshwater availability of around 450 m^3, Tunisia is one of the most drought-stressed countries in the Middle East and in North Africa regions. In this country, only 50% of all water resources have salinity levels lower

than 1.5 g/l and can be used without restriction. 84% of all groundwater resources have a salinity more than 1.5 g/l, and 30% of the shallow aquifers have a salinity more than 4 g/l. Planners are being forced to take into consideration any sources of water which might be used economically and effectively to promote further development (Pescod, 1992) especially if we consider the expansion of urban populations and the increased generation of domestic water supply and sewerage and their drawbacks in terms of greater quantities of municipal wastewater.

***Aloe vera*: an alternative for salt-affected soil use**

In order to combat water scarcity and soil salinization problems, a concerted effort is made to search alternative plants which may occupy salt affected soils (Rengasamy 2006). In this case, the cultivation of plants which have adaptive physiologies to stress, economic and medicinal values such as *Aloe vera,* seems as one interesting alternative. *Aloe vera* (*Aloe barbadensis* M.), is a desert plant with crassulacean acid metabolism (CAM) (Rodriguez-Garcia et al. 2007), a xerophyte with strong drought resistance and also with a certain degree of tolerance to salt stress although it is not usually taken as a halophyte (Zheng et al. 2004). To test the behavior of this plant in extreme salinity conditions, an experimental plot, with high salinity of soils, was chosen next Kalaât Landelous village in the northern part of Tunisia (35 km north of the capital Tunis), close to the Mediterranean Sea. The climate is Mediterranean semi-arid with an average rainfall of 450 mm y^{-1} and ET of 1400 mm y^{-1}. The soil is an alluvial formation of the Medjerda River, characterized by a fine texture (silty clay to clay).

During rainy seasons, the experimental plot (60 m x 40 m) becomes inaccessible due to water stagnation. In order to move away from the saline groundwater, the plot has been converted by an elevation of the land 1m to the soil surface.

Aloe vera plants (with an average of 9 leaves by plant) have been cultivated on the highest part of the soil. The irrigation has been done during the summer season and the irrigation water has a basic pH (7.90) and a moderate salinity (CE = 4.65 dS/m). Soil salinity is variable depending on whether the upper part of the soil or the ground surface is experimented. It depends also from the soil depth, the season, and the irrigation. In general, the soil is distinguished with a salinity characteristic: the electrical conductivity of the saturated soil paste extract which is more than 16 dS/m and sodium and chloride ions are the most dominant. This salinity is essentially due to the presence of a shallow and a highly saline groundwater. Indeed, the groundwater depth reaches 30 cm in the rainy seasons and 110 cm in the dry seasons, and the salinity flocculates between 68 and 107 dS/m.

Two years after the plantation, the summer irrigation of *Aloe vera* did not show a real effect of irrigation on soil and plant compositions. Despite the high salinity prevailing in the plot, 53 *Aloe vera* plants have survived among the 60 cultivated. However, the remaining plants showed a color change and a slight increase in leaf growth (number and length), organ with a high economic value. The gel, contained in the *Aloe* leaves, has a complex chemical composition, made primarily of soluble sugars, anthraquinones, polysaccharides, amino acids, vitamins and proteins, many of which are enzymes.

Taking into consideration that salinity conditions in the plot are extremely high, additional studies affecting gel composition should be conducted, in order to know if the *Aloe* gel quality will be modified under these extreme salinity conditions. Consequently, the medicinal and economic values of our plant will be affected.

Photos