Vegetation analysis of Wadi Al-Jufair, a hyper-arid region in Najd, Saudi Arabia

Abdulrahman Alatar, Mohamed A. El-Sheikh [1], Jacob Thomas *

Botany and Microbiology Department, College of Science, King Saud University, P.O. Box 2455, Riyadh 11451, Saudi Arabia

*** Corresponding author. Tel.: +966 1 4675807; fax: +966 1 4675806.**
E-mail address: jathomas@ksu.edu.sa (J. Thomas).
1 Permanent address: Botany Department, Faculty of Science, Damanhour University, Damanhour, Egypt.

E-mail address: mohamed.a.elshaikh@damanhour.edu.eg

Abstract

Wadi Al-Jufair, a tributary of Wadi Nisah, is one of the important wadis of Najd region (Saudi Arabia) sheltering a rich diversity of higher plants. The study area is extended into approximately 15 km2 encompassing the commonest geomorphological features encountered in desert wadis. The wadi supports several rare plants, including Maerua crassifolia Forssk., a regionally endangered tree, and Acacia oerfota (Forssk.) Schweinf., a rare shrub with restricted distribution.
The present study aims to analyze the vegetation of wadi Al-Jufair and propose its designation as an important plant reserve. The vegetation type is fundamentally of chamaephytic nature with some phanerophytes, and distinguished into associations where the dominant perennial species give the permanent character of plant cover in each habitat. Four vegetation groups were identified with the application of TWINSPAN, DCA and CCA programs and named after the characteristic species

as follows: Lycium shawii; A. oerfota; Acacia raddiana–Rhazya stricta and Artemisia monosperma.
These plant associations demonstrate significant variation in soil texture, moisture, organic matter, pH, EC, and minerals of Wadi Al-Jufair.

KEYWORDS:Plant diversity;Hyperarid wadi;Invasive species;Najd;Plant community;Saudi Arabia;Vegetation;Wadi Al-Jufair

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Ten years primary succession on a newly created landfill at a lagoon of the Mediterranean Sea (Lake Burullus RAMSAR site)

Mohamed A. El-Sheikh[a,*], Yassin M. Al-Sodany[b,1], Ebrahem M. Eid[b], Kamal H. Shaltout[c]

[a] Botany Department, Faculty of Science, Damanhour University, Damanhour, Egypt

[b] Botany Department, Faculty of Science, Kafr El-Sheikh University, 33516 Kafr El-Sheikh, Egypt

[c] Botany Department, Faculty of Science, Tanta University, 31527 Tanta, Egypt

abstract

This study was carried out on the transported bed soil dredged from the outlet of Lake Burullus to the Mediterranean Sea and deposited nearby, forming by this way new land that underwent a primary plant succession. The multi-methodological approach comprised floristic inventories, vegetation sampling and soil composition analyses of the study site in order to detect the crucial parameters controlling the plant resettlement on recently deposited soil as related to time, local micro-topography and substrate characteristics.

Floristic composition was assessed for the first 10 years of primary succession (2001–2010) on 18 stands of the area, distributed on basement, slope stands and plateau of the landfill, respectively.

Vegetation surveys were the basis of multivariate analyses of the vegetation and soil data using TWINSPAN,

DCA and CCA. Relationships between the edaphic gradients, floristic composition and species diversity were assessed.
Forty-one species were identified (22 annuals and 19 perennials) after ten years development compared with 7 species at the first year. After application of TWINSPAN and DCA on the data of the first year of establishment, two simple vegetation groups were recognized and named after their dominant species, Senecio glaucus and Bassia indica. In comparison, the multivariate analysis of the last year (i.e. after 10 years of succession) led to identify 4 more advanced vegetation groups: Senecio glaucus–Cakile maritima–Zygophyllum album, Bassia indica–Mesembryanthemum nodiflorum, Arthrocnemum macrostachyum and Phragmites australis–Limbarda crithmoides. These plant communities are comparable to the other communities in the same region, showing the tendency to establish the climax vegetation of Mediterranean coastal areas. The notable edaphic variables that affect the succession of the vegetation groups in the study area were moisture, salinity, organic matter, minerals (Ca, Na, K, Cl, SO4), soil texture and human disturbance.

Keywords: Lake Burullus, Annual invasion, Halophytes, Seral succession, Coastal pioneer vegetation, Wetlands

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Seasonal courses of nutrients and heavy metals in water, sediment and aboveand below-ground Typha domingensis biomass in Lake Burullus (Egypt): Perspectives for phytoremediation

Ebrahem M. Eid[a,*], Kamal H. Shaltout[b], Mohamed A. El-Sheikh[c,1], Takashi Asaeda[d]

[a] **Botany Department, Faculty of Science, Kafr El-Sheikh University, 33516 Kafr El-Sheikh, Egypt**

[b] **Botany Department, Faculty of Science, Tanta University, 31527 Tanta, Egypt**

[c] **Botany Department, Faculty of Science, Damanhour University, Damanhour, Egypt**

[d] **Institute for Environmental Science and Technology (IEST), Saitama University, 255 Shimo-Okubo, Sakura-ku, Saitama shi, 338-8750, Japan**

abstract

The present study was carried out in natural stands of Typha domingensis in Lake Burullus, Egypt, to investigate (1) nutrient dynamics and heavy metals accumulation in its organs, (2) the phytoextractive potential of its organs and (3) the amount of nutrients and heavy metals released back into the water after decomposition of the dead tissues. Nitrogen concentrations were higher in the shoot than in the

root and rhizome, while P, Ca, Cu, Fe, Zn and ash concentrations were higher in the root than in the rhizome and shoot. Significant differences in the concentrations of Mg, Cd, Cu and ash were assessed during the growing season of T. domingensis. The content of most nutrients and heavy metals in the shoot increased rapidly during the early growing season in February, reached maximal values in July and then decreased again. The nutrient and heavy metal contents in the below-ground portion of the plant showed an opposite trend compared to the shoot; they decreased sharply during the spring, when they were translocated, supporting the heterotrophic phase of shoot growth. However, they increased slightly from July to September and then decreased again. The transfer factors of all nutrients and heavy metals from the sediment to the below-ground organs were greater than unity. The higher translocation ratio of N in T. domingensis shoots makes it suitable for N phytoextraction from water and sediment, while the lower translocation ratios for Cd, Cu, Fe, Pb and Zn make it suitable for metal ion phytostabilisation.
The dead shoot biomass of the stands at the end of 2010 amounted to 1950 g DM m−2, when the seasonal decomposition process began. With a decay rate of 0.0049 day−1, 1624 g DM m−2 is decomposed in the lake in a year. This is equivalent to releasing the following nutrient and heavy metals into the surrounding water (in g m−2): 23.4 N, 0.8 P, 19.2 Ca, 1.8 Mg, 5.6 Na, 32.8 K, 0.01 Cd, 0.01 Cu, 0.84 Fe, 0.12 Pb and 0.03
Zn.

Keywords: Cattail, Heavy metals, Lake Burullus, Nutrient elements, hytoremediation

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Uptake of Ag, Co and Ni by the Organs of *Typha domingensis* (Pers.) Poir. ex Steud. in Lake Burullus and Their Potential Use as Contamination Indicators

Ebrahem M. Eid[1]*, Mohamed A. El-Sheikh[2,3], Abdulrahman A. Alatar[2]

[1]Botany Department, Faculty of Science, Kafr El-Sheikh University, Kafr El-Sheikh, Egypt;

[2]Botany & Microbiology Department, College of Science, King Saud University, Riyadh, Saudi Arabia;

[3]Botany Department, Faculty of Science, Damanhour University, Damanhour, Egypt.

Email: *ebrahem.eid@gmail.com

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ABSTRACT

The concentrations of Ag, Co and Ni in the sediments and the different organs of *Typha domingensis* from Lake Burul-lus, Egypt, were investigated monthly from February to September 2010 to evaluate the aquatic environment quality of the lake and to test the suitability of these organs for bio-indicating of sediment metals. The sediment heavy metals were found to decrease in the order of Ni > Co > Ag. The sediment contents of Ag were about 45 times above the worldwide range. On the other hand, Co concentrations were below the reference ranges of United States and Chinese soils. The heavy metals bioaccumulation decreased according to the order of rhizome > root > leaf for Ag; and root > rhizome > leaf for Co and Ni. It was found also that, *T. domingensis* had no significant differences in heavy metals concentrations over time. The transfer factors of Ag, Co and Ni from sediment to below-ground organs were smaller than one. Co had the maximum transport from below-ground to above-ground organs, while Ag had the minimum. There was a significant linear correlation between the concentration of Ag in root of *T. domingensis* and that in sedi-ment. This result suggested that *T. domingensis* can be regarded as bio-indicator for Ag pollution of Lake Burullus.

Keywords: Bio-indicators; Cattails; Heavy metals; Lake Burullus; Macrophytes; Wetlands

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