The College of Graduate Studies and the College of Agriculture and Veterinary Medicine Cordially Invite You to a

Master Thesis Defense

Entitled

COMPARISON OF THREE DIFFERENT NATIVE WOODY SPECIES FOR THEIR ABILITY TO UTILIZE NUTRITIONAL ELEMENTS SUPPLIED IN THE FORM OF BIOSOLIDS AND MINERAL FERTILIZER.

by

Fatima El-Telib El-Tayeb Hassan

Faculty Advisor

Dr. Elke Neumann, Department of Integrative Agriculture

College of Agriculture and Veterinary Medicine

Date & Venue

2:00 PM

Monday, 15 November 2021

F3-040

Abstract

Plant production systems of the future will need to focus on recycling rather than through flow of mineral nutritional elements. A large portion of nutritional elements leaving farming systems with the harvest products ultimately end up in household waste and sewage. Returning nutrient-rich products of the sewage treatment process to agricultural soils needs to occur in an environmentally safe and culturally acceptable manner. The UAE maintains more than 100.000 ha of man-made forests comprising mainly indigenous species like *Prosopis cineraria* (ghaf) and *Vachellia tortilis* (Samar). It has been proposed that biosolids, the dry residues of the sewage treatment process, are returned into plant production systems via application to these forests, as these neither serve directly in food production nor are very close to human settlements. However, little is known about how native desert plants would respond to such additional fertilizer input. The present study compared the ability of ghaf and Samar trees to utilize nutritional elements provided either in the form of biosolids or mineral fertilizers salts. *Clerodendrum inerme* plants were involved in this experiment as a third species, representing an exotic and, faster-growing woody plant. Young plants of approximately equal size were grown the greenhouse in pots filled with sandy dune soil mixed with nutritional elements at three different supply levels. The nutritional elements were either supplied in the form of biosolids or mineral fertilizers. The soil prepared for the 'Low' 'Medium' and 'High' biosolids fertilization treatment was mixed with 3.2, 6.4, and 12.8 g of dry biosolids per kg dry soil, respectively. This corresponded to 60, 120, and 240 mg N per kg dry soil. The plants were harvested nine months after experiment set-up, and their dry weights and nutritional element uptake into the shoot were assessed. Compared with the desert tree species, Clerodendrum plants had much higher dry weights by the end of the experiment. Still, none of the species showed a positive growth response to increasing the supply of nutritional elements. The Clerodendrum plants showed an increase in the uptake of macronutrients with increasing fertilizer supply and were equally well able to utilize nutritional elements from within biosolids and mineral fertilizers. The native trees did not show an increase in element uptake in response to increasing fertilizer supply. The growth of the ghaf trees responded negatively to a high supply of biosolids but not to a high supply of mineral fertilizer. In conclusion, the results of our study suggest that the ability to take up and utilize nutrients supplied in the form of biosolids may be limited in desert trees like ghaf and Samar. Opportunities for biosolids valorization may be larger through plantations of exotic species with a higher growth and element uptake potential compared with the native trees.

Keywords: Biosolids, soil amendment, fertilizer, nutritional elements, native tree species.