



Miracle Grass for Soil Stabilization in Kuwait

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Abstract

Kuwait desert, with meagre vegetation cover, is marred by sand movement and the deteriorating nutrient condition of the soil. This is a serious issue when we consider biological wind break as a partial environment friendly solution for soil stabilization. Vetiver (*Chrysopogon zizanioides* L. Nash) is termed as a miracle grass due to its tolerance to extreme temperatures, ability to exhibit brilliant growth performance in degraded and polluted soil/water and can be considered as a practical way for sustainable environmental conservation. The experiments conducted at the Agricultural Research Station, Sulaibiya prove that the noninvasive Vetiver is effective in trapping moving sand and improving microbial population, native plant population, and diversity. Vetiver planted area reduced sand movement and trapped 226% more sand than the control (unplanted) area, and a row spacing of 10 m was found to be the best among the tested treatments. However, a closer row spacing (< 10 m) should be tested in future studies.

Introduction

Soil erosion and displacement is a major concern in the open desert areas of Kuwait due to loose soil and high wind speed resulting in severe sand movement in the open areas. Vegetation cover reduces the wind speed and act as a soil-binding agent. Establishment of plants in the desert area, which is exposed to harsh conditions, is a major challenge. Hence, Vetiver, a xerophytic drought-tolerant, sterile, perennial grass with a long root system that can grow in extreme weather and soil conditions (Grimshaw, 2006), was evaluated for its soil stabilization ability in the open desert of Kuwait. The Arid land Agriculture and Greenery Department of the Kuwait Institute for Scientific Research initiated this task in January 2012 at the Agricultural Research Station, Sulaibiya.

Objective

The main objective of this study was to evaluate the performance of the Vetiver system in selected open desert settings under Kuwait's environmental conditions for soil stabilization.

Methods

Ten Vetiver cultivars were planted at 20 cm plant spacing in a completely randomized block design. Peat moss, perlite, and agricultural soil (1:1:1 v/v) mix was used as the planting medium. The Vetiver was planted in rows at right angles to the prevailing wind with 10 m, 20 m or 30 m row spacing and replicated thrice.

To assess the amount of sand dislocated by the wind, sand traps were installed at the site.

Native plant population and diversity in each experimental site was recorded during spring (March to April 2012) and late spring (May to June, 2012) or the transitional interval period.

Microbial populations were assessed through spread plate technique to quantify the microbial colonies present in the soil.

The data were analyzed using two-way ANOVA with distance, and Duncan's Multiple Range test was used to ascertain the significant differences among treatments.

Results

- The planted area reduced the sand movement and trapped 226% more sand than the control area.
- The microbial populations in the planted areas and the space between the planted areas were higher than those in the control area.
- The highest quantity of sand was collected in 10 m row spacing (17.833 kg/ 500 m²) followed by 20 m row spacing and 30 m row spacing.
- During spring, the highest annual native plant species diversity and population was observed in experimental plots with 10 m row spacing followed by 20 m and 30 m row spacing (Figure 1).
- During late spring, diversity and population of native plants were higher in Vetiver planted area, when compared to control.

Conclusion

- The miracle grass Vetiver is effective in trapping moving sand and improving microbial population, native plant population, and diversity.
- Its long and robust root system binds loose soil, trapping moving sand along with dispersed native seeds to promote native plant population and diversity.

References

Grimshaw, R. 2006. Global and regional applications of the Vetiver system. *Proceedings of Workshop on Potential Applications of Vetiver Plant in the Arabian Gulf Region, Kuwait*, p. 35-45.

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Sand deposits causing road block at Sulaibiya

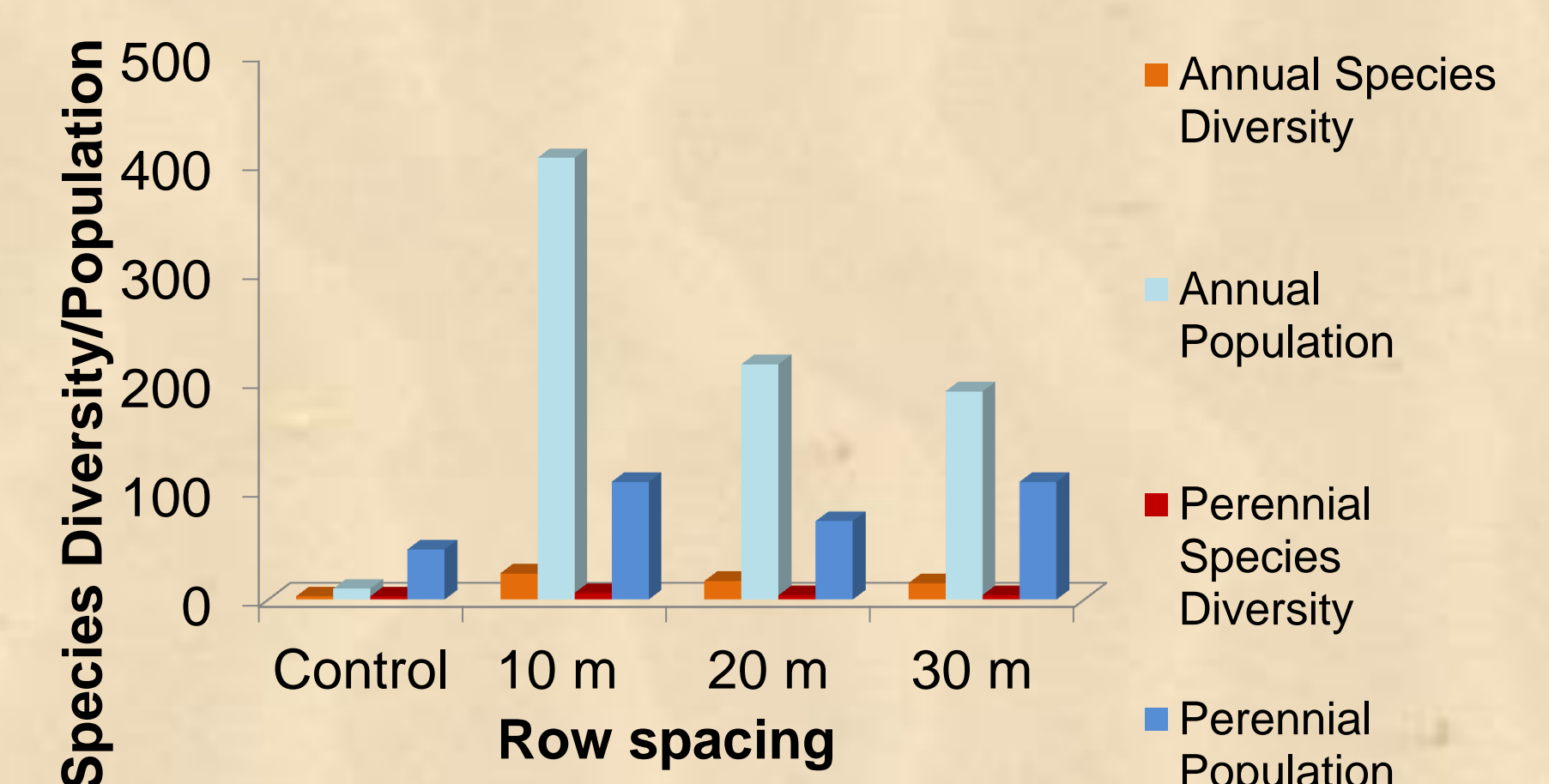
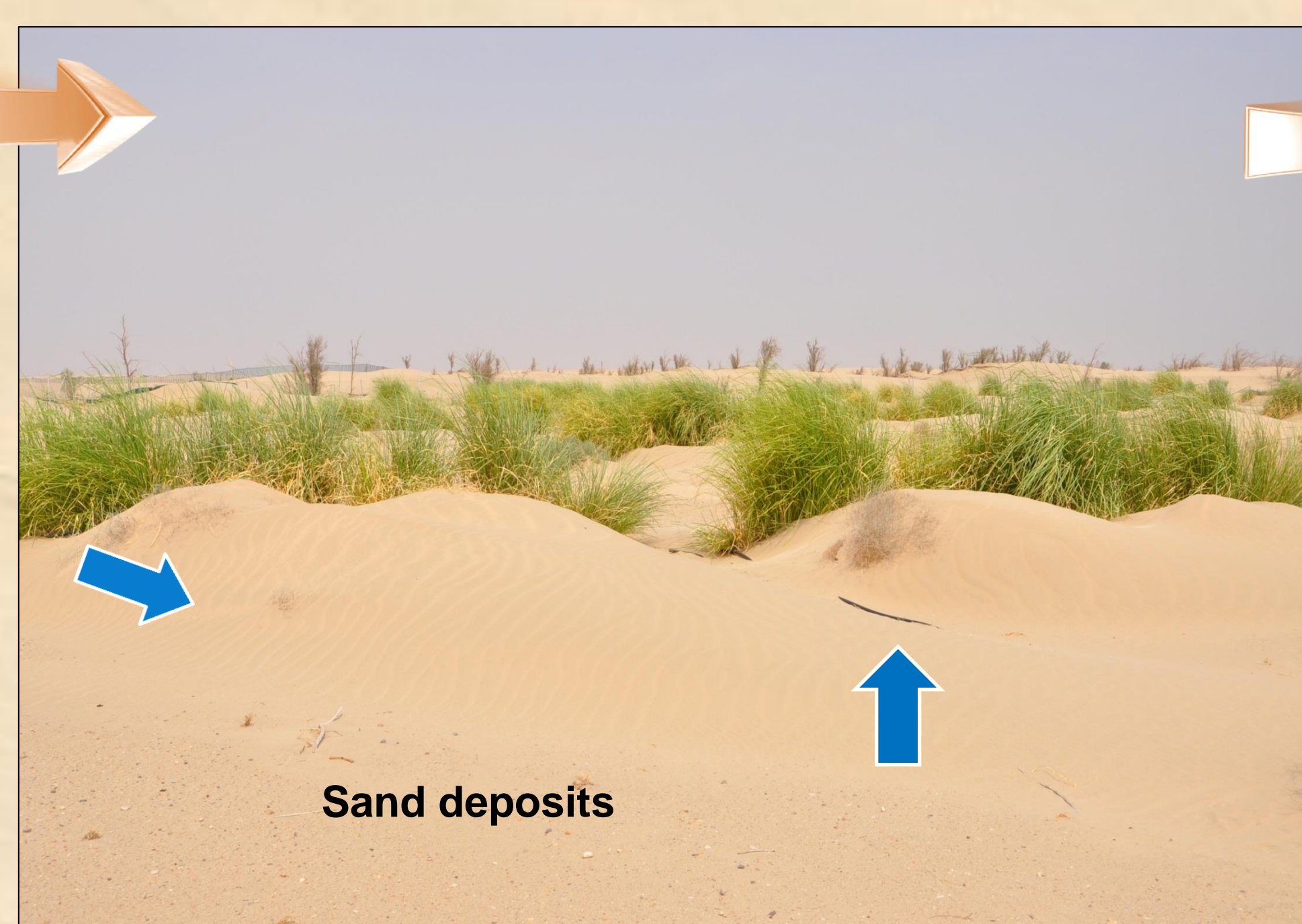


Figure 1. Species diversity and population in control and the Vetiver planted area



Vetiver plants immediately after planting



Sand collected near Vetiver plants



Desert greenery