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## Adaptation to water-poor conditions : an experimental study with *Buchloe dactyloides*

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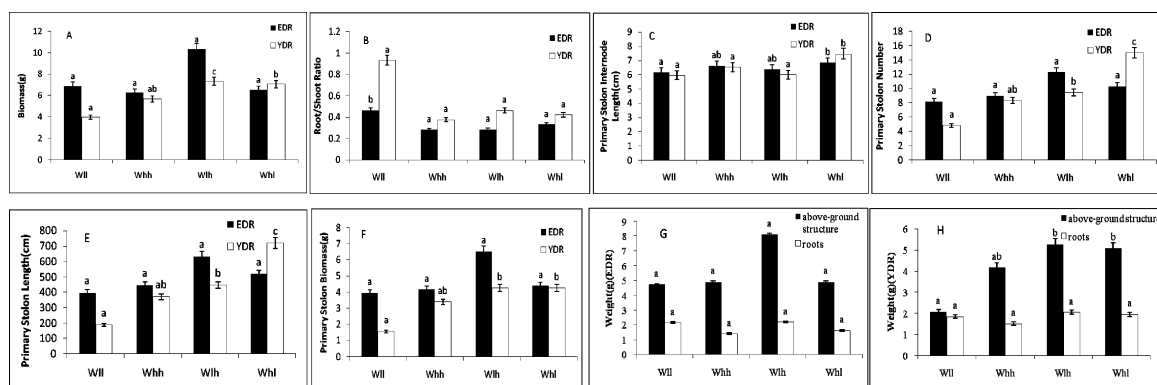
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**Key words** clonal plant, stolon, homogeneous, heterogeneous, turf

**Introduction** Clonal integration, the ability of clonal plants to transfer resources between connected ramets can improve total plant's performance in patchy environment. The water requirement of *Buchloe dactyloides* is considerably less than other turf species; this may contribute to the physiological integration pattern within clonal fragments. The hypothesis was tested in this experiment.

**Materials and methods** In a glasshouse experiment, similar-sized ramets Elder Daughter Ramet (EDR) (proximal to parent ramet) and Young Daughter Ramet (YDR) (distal one) connected by uniform length of stolons were grown in two partitioned similar-sized containers to experience the same or different water supply. The high and low level of water supply were 100-150 ml and 20 ml tap water per container per day respectively. There were 6 replicates for each treatment. The plants were harvested after 91 days of treatments (from July 6, 2005 to Sep 7, 2005) and the following measurements were taken: above-ground biomass and root biomass, primary stolon length, number, weight, and node numbers of both EDR and YDR. All measurements were analyzed by means of one-way analyses of variance.

**Results** Root mass did not respond to the variation in water supply. Above ground structure of YDR was more responsive to the variation in water supply than EDR (Figure 1G; 1H). Heterogeneous treatments produced more biomass than homogeneous treatments. The biomass of YDR given low water supply was pronouncedly enhanced due to its connection to EDR in high water patches, while the biomass of EDR was not reduced because of its support for YDR in stressful environment, which suggested that only surplus water would be transferred from donor to recipient (Hutchings and John, 2004), and established ramets provided strong support for newly-produced ramets through dominant acropetal movement of water resource (Figure 1A; 1D; 1F; 1G). Root/Shoot Ratio and primary stolon internode length exhibited no significant response to the variation in water supply, except Root/Shoot Ratio of EDR was enhanced in low water availability (Figure 1B; 1C). In contrast, the number, weight and length of primary stolon increased with increasing water supply, especially YDR (Figure 1C; 1D; 1E; 1F). For all treatments, the biomass of primary stolons accounted for more than 60 percent of ramet biomass, which indicated that the primary stolon of *B. dactyloides* primarily served as storage organs for meristem and carbohydrate, rather than foraging structure.



**Figure 1** The biomass (A), Root/Shoot Ratio (B), mean primary stolon internode length (C), primary stolon number (D), primary stolon length (E), primary stolon biomass (F) of EDR and YDR, above-ground biomass and root mass of EDR (G) and YDR (H) subjected to homogeneous and heterogeneous water treatments.

**Conclusions** Vascular constraints are usually absent in monocotyledons like *B. dactyloides* so that water can be easily transported among all connected ramets (Feng et al., 2007). The initial hypothesis was obviously confirmed in this experiment. Thus, the ecological adaptation strategy of *B. dactyloides* to water-poor conditions is to develop storage organ-stolons, and elder ramets providing support for juvenile ramets, rather than plastic morphological foraging behaviour, such as changing primary stolon internode length or root mass.

### References

- Liu, F.H., Liu, J., Yu, F.H. and Dong, M., 2006. Water integration patterns in two rhizomatous dune perennials of different clonal fragment size. *Flora* 202, 106-110.
- Hutchings, M.J. and John, E.A., 2004. The effect of environmental heterogeneity on root growth and root/shoot partitioning. *Annals of Botany* 94, 1-8.