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Adaptation to Water-Poor Conditions: An Experimental Study with *Buchloe dactyloides*

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

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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 91days 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 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 .

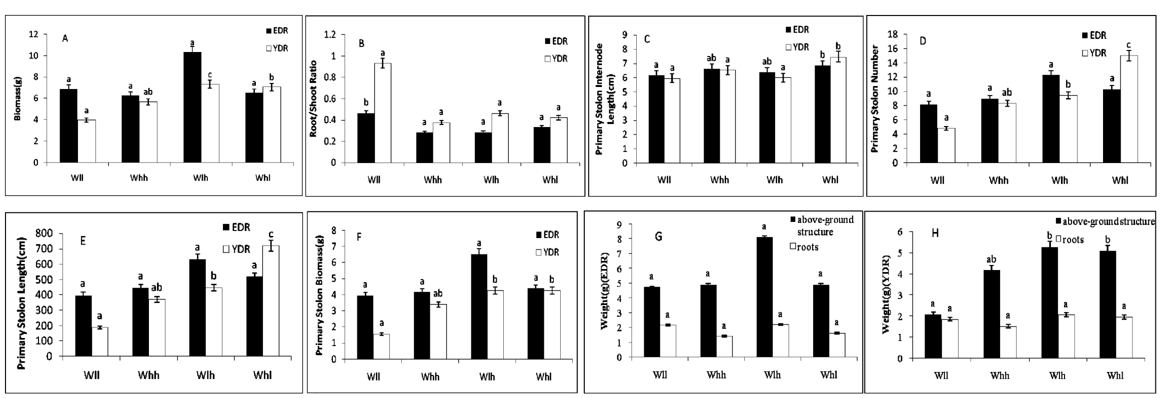

Figure 1 *The biomass (A) , Root/Shoot Ratio (B) , mean primary stolon internode length(C) , primary stolon number (D) , primary stolon length (E) , primary stolon biomass (F) of EDR and YDR , above-ground biomass and root mass of EDR(G) and YDR (H) subjected to homogeneous and heterogeneous water treatments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

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

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