

## Adaptive Strategies of Clonal Shrub to Sand Dune Environment in Desert-Oasis Transitional Zone

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**Abstract :** Plants growth in desert often suffered from stresses like water deficit, wind erosion and sand burial. Thus, plants in desert always have unique strategies to adapt these stresses. However, data regarding how clonal shrubs withstand wind erosion and sand burial in natural habitats remain relatively scarce. Therefore, we selected a common clonal shrub *Calligonum arborescens* to study the adaptive strategies of clonal plants to sand dune environment in a transitional zone of desert and Hexi Oasis of China. Our results show that sand burial is one of the essential prerequisites for the survival of *C. arborescens* rhizome fragments. Both the time and degrees of sand burial and wind erosion had significantly effects on clonal reproduction and growth of *C. arborescens*. With increasing burial depth, the number of ramets and biomass production significantly decreased. There is same change trend in severe erosion treatments. However, the number of ramets and biomass production significantly increased in moderate erosion treatments. Rhizome severed greatly decreased ramet number and biomass production under both sand burial and severe erosion treatments. That indicated that both sand burial and severe erosion had negative effects on the clonal growth of *C. arborescens*, but moderate wind erosion had positive effects. And rhizome connections alleviated the negative effects of sand burial and of severe erosion on the growth and performance of *C. arborescens*. Most fragments of *C. arborescens* grew in the directions of northeastern and southwestern. Ramet number and biomass, rhizome length and biomass in these two directions were significantly higher than those found in other directions. Interestingly, these directions were perpendicular to the prevailing wind direction. Distribution of *C. arborescens* differed in different habitats. The total number of individuals was significantly higher in inter-dune areas and on windward slopes than on the top and leeward slopes of dunes; more clonal ramets were produced on the top of dunes than elsewhere, and a few were found on leeward slopes. The mainly reason is that ramets on windward and top of dunes can easily suffered with moderated wind erosion which promoted clonal growth and reproduction of *C. arborescens*. These results indicated that *C. arborescens* adapted sand dune environment through directional growth and patchy distribution, and sand-burial and wind erosion were the key factors which led to the directional growth and patchiness of *C. arborescens*.

**Keywords :** adaptive strategy, *Calligonum arborescens* Litv, clonal fragment, desert-oasis transitional zone, sand burial and wind erosion

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