Variation in shoot water relations and biomass production and partitioning during drought were evaluated in 6-month old seedlings of Acacia senegal from four geographically diverse sources (viz: El-fashir and Hawata from Sudan, Windou-tiengloy from Senegal and Dha-bi-ji from Pakistan). The seed sources were divided into two categories: xeric (El-fashir and Dha-bi-ji) and mesic (Hawata and Windou-tiengloy) on the basis of moisture gradients. Seedlings were grown in long soil columns with high water holding capacity under uncontrolled environment. Half of the seedlings of each provenance were subjected to water stress, while the rest was kept well-watered (control). Progressive soil drying significantly reduced water potential of all provenances; however, xeric provenances maintained higher shoot water balance under severe soil drying than mesic provenances. Dha-bi-ji exhibited significantly lower shoot, root, total biomass and root/shoot ratio compared to the other provenances under irrigated conditions. However, soil drying reduced significantly shoot, root growth, total biomass and specific leaf area of all provenances, with the exception of Dha-bi-ji, compared to well-watered seedlings. Drought induced a considerable shift in biomass allocation pattern of Dha-bi-ji seedlings in favour of root growth, which resulted in 13% increase in root weight and 27% increase in root:shoot ratio. The results indicate that Dha-bi-ji had the most conservative growth strategy, a response characteristic associated with drought-avoidance mechanisms. Based on the physiological and morphological observations, Dha-bi-ji would be the most suitable provenance for establishment of plantations in arid lands.