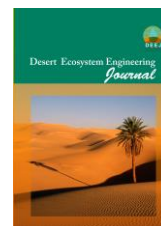




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Establishment of a Seed Orchard and Evaluation of the Morphological Characteristics of *Calligonum arborescens* Litv.

M. Abtahi¹, K. Spahbodi²

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Abstract

Introduction and Objective: *Calligonum arborescens* Litv. is one of the most important drought-tolerant species native to the desert regions of Iran. The establishment of a seed orchard aims to produce seeds from selected superior genotypes for the propagation and cultivation of this species, ultimately contributing to wind-erosion control and the rehabilitation of desert ecosystems. In this study, four populations of *C. arborescens*, namely Abuzeydabad (A), Baghiyat-e Kashan (B), Qasemabad (C), and Hosseinabad-e Qom (D), were selected and compared based on morphological traits and establishment percentage using a hierarchical (nested) experimental design to identify superior populations.

Materials and Methods

Twenty cuttings were prepared from each of 20 selected mother plants per population, resulting in a total of 1,600 cuttings transferred to the greenhouse. From each population, 12 mother plants were subsequently selected based on the number of rooted cuttings and established in the seed orchard. Plant height, canopy diameter, and the number of surviving cuttings (survival rate) were recorded. Data were analyzed using nested analysis of variance (nested ANOVA) for continuous traits and a generalized linear mixed model (GLMM) for survival data in SPSS version 26. Mean comparisons among populations were performed using Fisher's least significant difference (LSD) test at the 5% significance level.

Results

Population had a highly significant effect on plant height ($F = 18.27$, $P < 0.001$) and canopy diameter ($F = 9.48$, $P < 0.001$), whereas the effect of mother plants nested within populations was not significant ($P > 0.05$). Based on mean comparisons, populations B and A were classified in the superior group (a), whereas populations D and C were classified in the lower group (b) for growth traits. The highest survival rate (75%) was observed in population B, whereas the lowest (54%) was recorded in population C.

Conclusion

Abuzeydabad (A) and Baghiyat-e Kashan (B) were identified as superior populations for the establishment of seed orchards of *Calligonum arborescens*. The non-significant effect of mother plants nested within populations suggests that the observed variation among mother plants was relatively

1. Corresponding author, Associate prof., Research Division of Natural Resources, Isfahan Agricultural and Natural Resources Research and Education Center (AREEO), Kashan, Iran

2. Associate Prof., Research Division of Natural Resources, Mazandaran Agricultural and Natural Resources Research and Education Center, AREEO, Sari, Iran.

small compared with the variation among populations under the conditions of this study. However, because the present study did not directly assess genetic diversity, further molecular analyses using appropriate molecular markers are recommended to confirm the extent and structure of within- and among-population genetic variation.

Keywords: Clonal orchard, Genetic diversity, Calligonum SP. Superior genotypes, Kashan.