

Irrigation frequency and soil type influence germination and early growth of quinoa (*Chenopodium quinoa* Willd)

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Abstract

The adoption of quinoa as a potential food crop in semi-arid Zimbabwe is threatened by poor seed establishment. A 4 x 3 factorial experiment arranged in a completely randomised design (CRD) was carried out to establish the effects of irrigation frequencies and different soil types on germination and early growth of quinoa. Three soil types (sand, loam, and clay) and four irrigation frequencies (after every 1, 2, 3, and 4 days) were used. Measurements taken included days to 50% emergence, germination percentage, mean germination time, germination rate index, coefficient velocity of germination, seedling height, final crop stand, and root density. Analysis of variance (ANOVA) was done using GenStat 18th Edition and mean separation was done using the Least Significant Difference (LSD) at a 5% significance level. There was an interaction between irrigation frequency and soil type on days to 50% emergence ($p < 0.05$), germination percentage ($p < 0.05$), germination rate index ($p < 0.05$), seedling height ($p < 0.05$), root length density ($p < 0.05$), seedling crop stand ($p < 0.05$). Sandy soil irrigated on 1-day intervals recorded the highest germination percentage (96.7%), while clay irrigated on 3-day intervals recorded the lowest (41.7%) final germination percentage respectively. Seeds planted in sand and clay recorded the shortest (3.25) and longest (4.5) mean germination time (days) respectively. Loamy and sandy soils irrigated on 3-day intervals and 1-day intervals recorded the lowest (29.4%) and highest (70.4%) germination rate index respectively. Loam soil irrigated on 1-day and 4-day intervals recorded the highest (16.37cm) and shortest (9.3cm) seedling height. Loam soil irrigated on 2-day and sandy soil irrigated on 3-day intervals recorded the lowest (3.07cm/cm³) and the highest (21.23cm/cm³) root length densities respectively. Sand irrigated on 1-day intervals recorded the highest (85%) crop stand. Findings concluded and recommended planting and frequently irrigating quinoa in sandy soils for better crop establishment.