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Irrigation Regimes in Quinoa: First Results

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Introduction

Quinoa (*Chenopodium quinoa* Willd.) is an emerging crop of Amaranthaceae botany family, it is native of the Andean regions and its scientific and commercial interest is increasing. The seed of quinoa is a gluten-free product, used for years as a new functional food. For the agronomic aspect it is considered a resistant specie to several stresses such as salinity, high and low temperatures and different soil pH (Jacobsen, 2017).

Objective

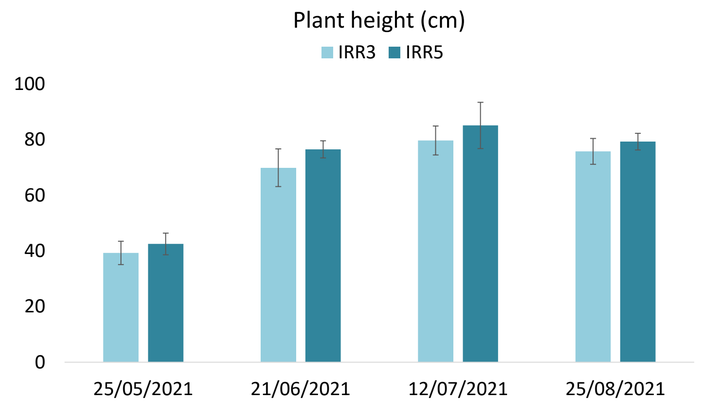
The aim of the experiment is to assess the effect of application of two different irrigation regimes on cultivated quinoa in Southern Italy.

Materials and Methods

The experiment was carried out at the "CREA-CI" experimental farm in Foggia, Italy, during the 2021 growing season. The experimental design, a completely randomized block with 3 replications, consisted of 6 plots, 48 m2 each one (6m x 8m), with 2 different irrigation regimes: IRR3 with 3 irrigations, and IRR5 with 5 irrigations. The irrigation supplies were applied at the following phenological stages: sowing (IRR3; IRR5), emergence BBCH 12 (IRR5), flowering at 10% BBCH 62 (IRR3; IRR5), flowering at 50% BBCH 67 (IRR3; IRR5), milky grain seed stage BBCH 81 (IRR5). Each irrigation regime received 40 mm at sowing and at emergence, and 70 mm of water for the following irrigation supplies. The irrigation system consisted of driplines placed in alternate crop rows. The quinoa sowing (cv Regalona Baer) was performed on 31st March in rows 50 cm apart and at a density of 25 seeds m^{-2}. During the growing season, phenological dates, plant height, soil moisture at 0-30 cm depth with gravimetric method were recorded. At harvest (30th August) seed yield, thousand kernel weight and seed moisture were measured; finally, ten plants were taken from each plot and morphological traits were recorded. Statistical analysis (ANOVA) was carried out according to the experimental design, and t-test as mean separation test.

Results

The first results, even if derived from only one year of experiment, are in agreement with previous experiences in the same environment and with the same quinoa variety, where seed yield in the range 0,5-2.0 t ha^{-1} with seasonal water supplies (rainfall + irrigation) from March to July of about 300-400 mm were recorded (De Santis et al., 2016; De Santis, unpublished data).



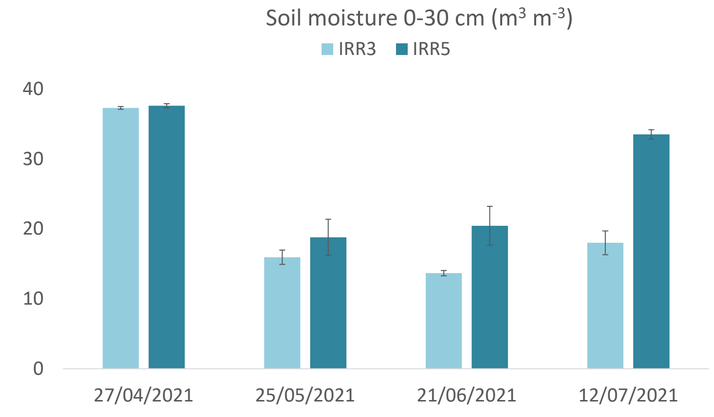


Fig. 1 Average Quinoa plant height and soil moisture at 0-30 cm soil depth of the two irrigation treatments measured during the growing season. The bars indicate the standard deviations.

Irrigation treatments	Fresh plants biomass yield (t ha^{-1})	Total plants d.m. (%)	Seed yield (t ha^{-1})	1000 kernels weight (g)
IRR3	8.78	60.34	0.59 b	1.50 b
IRR5	9.46	48.70	0.98 a	2.03 a

Tab. 1 Total plant biomass, percentage of plant dry matter, seed yield and thousand kernel weight at harvest (different letters indicate different values at P<0.05, t-test).

Conclusions

The results showed that quinoa, even if it needs of moderate water supplies to be cultivated in the climatic conditions of southern Italy, had a good response to irrigation treatment. The importance to maintain a certain soil moisture level also during the seed formation and repening resulted essential to obtain adequate seed yield, size and weight.

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