Società Italiana di Agronomia
50° Convegno Nazionale

Evoluzione dei sistemi agronomici in risposta alle sfide globali
Udine, 15-17 settembre 2021

Effect of different irrigation levels and nitrogen doses on seed yield of castor

Silvio Calcagno[1], Alessandra Piccitto[1], Venera Copani[1], Sebastiano Andrea Corinzia[1], Danilo Scordia[1], Giorgio Testa[1], Cristina Patanè[2], Salvatore Luciano Cosentino[1]

[1]Dip. di Agricoltura, Alimentazione e Ambiente (Di3A), Università degli Studi di Catania, IT, sl.cosentino@unict.it

[2]CNR- Istituto per la BioEconomia (IBE), Sede Secondaria di Catania, IT

Introduction

Castor (*Ricinus communis* L.) is one of the largest crop not used for food consumption, very suited to arid and semiarid zones, by its easy cultivation, its drought and salinity tolerance and adaptation to several growing conditions.

The present study investigates the optimization of cultivation techniques through the evaluation of the reduction of agronomical inputs in order to increase seed yield thereby reducing environmental burdens, by changing irrigation levels and nitrogen fertilization doses under the semiarid Mediterranean area.

Materials and Methods

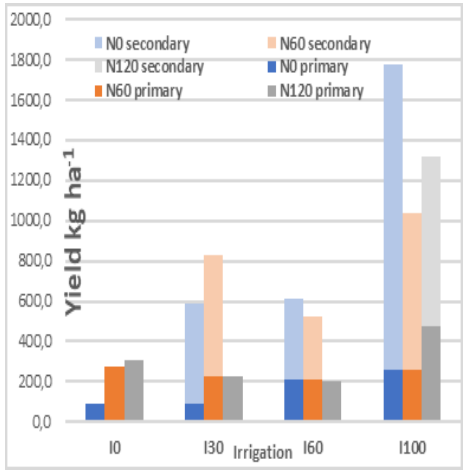
The field experiment was conducted over the period 2020-2021 at the Experimental farm of the University of Catania, Italy (10 m a.s.l., 37°25' N lat., 15° 03' E long.) in a typical xerofluvent soil. The soil of the experimental area was ploughed before sowing and fertilized with 70 kg ha^{-1} P_2O_5 (as single superphosphate).

Two experimental factors were studied: irrigation and fertilization. Irrigation was applied as main plot and fertilization as sub plot. Four irrigation levels were applied: *i)* irrigation only at sowing (I0) and the restoration of 30 (I30), 60 (I60) and 100% (I100) of the maximum evapotranspiration and *ii)* three fertilization levels: 0 (N0), 60 (N60) and 120 (N120) kg N ha^{-1} (as ammonium sulphate). A split-plot design with three replications was used, with fertilization levels randomly assigned within the main irrigation plot.

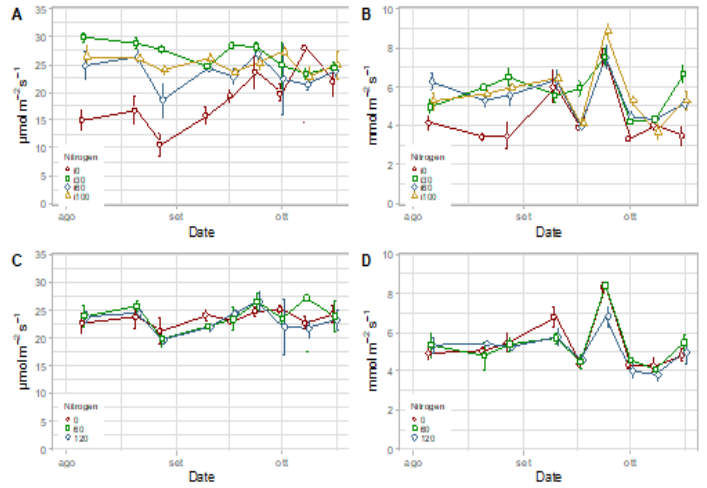
Results

Irrigation and fertilization influenced the number of secondary racemes per plant. High levels of water availability allowed for the development of secondary racemes. High N fertilization levels improved the vegetative growth delaying the formation of secondary racemes. Irrigation was also the main factor influencing seed yield. Higher soil water availability than the rainfed treatment (I0) induced higher photosynthesis and transpiration rate and consequently higher seed production. Fertilization had a positive effect on the seed yield from primary racemes, but induced a delay in the development of secondary racemes, causing a reduction of mean seed yield from secondary racemes. Excessive N led to prolonged vegetative growth with non-significant increase in yield. The soil nitrogen availability did not affect the photosynthesis and transpiration rate.

Seed yield (kg ha^{-1}) of first and second order raceme of castor under irrigation and fertilization levels



A) Net photosynthesis (µmol CO_2 m^{-2} s^{-1}) according to the irrigation level and C) nitrogen fertilization levels. B) Transpiration rate (mmol H_2O m^{-2} s^{-1}) according to the irrigation level and D) nitrogen fertilization levels.



Conclusions

It is worth mentioning that present data refer to the establishment year and first harvest of a perennial castor type, and significant yield increases can be expected during the subsequent years. Significant increases in seed yield were obtained with increased water supply. The yield increase in response to irrigation was associated with more racemes per plant, more capsules per plant on the first and other order racemes and with higher seeds weight per capsule. The effect of nitrogen fertilization on yield component was less marked, mainly due to the influence of vegetative growth duration. High soil nitrogen content combined with low water availability was detrimental for castor productivity.