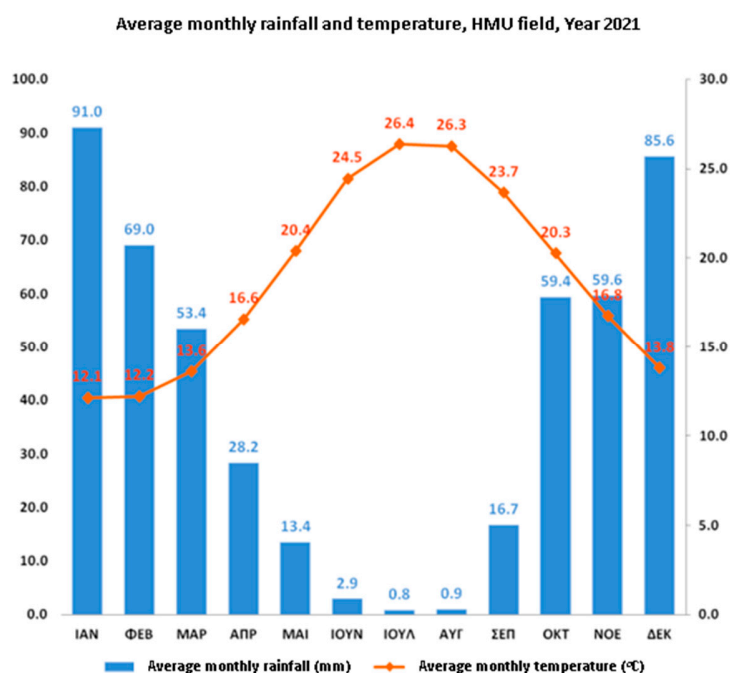


Supplementary material Methods S1. Experimental design, climate, soil properties and fertilization treatments

Experimental design: The experimental design employed completely randomized blocks of 10 plants of *Carlina diae* per block and three blocks per treatment which were randomly located in different rows. To achieve the same starting plant material, all plants were trimmed at 5 cm above ground level at the end of April 2021. At the end of May (i.e., 30 d following trimming), six fertilization treatments were initiated, and were performed weekly till the final harvest. An automatic irrigation system was constructed with 2 L h⁻¹ adjustable drippers to supply water to the plants three times per week. Pest and disease control was not necessary, but removal of weeds was regularly required which was manually performed. Final harvest was carried out at the end of June 2021.

Climate:



Average monthly rainfall and average monthly temperature at the field experiment in the campus of the Hellenic Mediterranean University, Heraklion, Crete (Greece) in an area of 20 × 25 m (35°19' N and 25°6' E, 60 m). The plants were transplanted into the soil 1 March 2021. The final harvest

was carried out 30 June 2021. ΙΑΝ: January; ΦΕΒ: February; ΜΑΡ: March; ΑΠΡ: April; ΜΑΙ: May; ΙΟΥΝ: June; ΙΟΥΛ: July; ΑΥΓ: August; ΣΕΠ: September; ΟΚΤ: October; ΝΟΕ: November; ΔΕΚ: December.

Soil properties: Part of the soil sample of the experimental field passed through a 2-mm sieve and was analyzed in triplicate for certain general properties and available concentrations of macro- and micro-nutrients. Briefly, the soil was sandy loam, alkaline and calcareous, with low organic matter content and sufficient or high content of available N, P, K, Cu, Zn, Fe, Mn, and B [5]. Organic C was determined by the wet oxidation method; total N by the Kjeldahl method and CaCO₃ by a calcimeter. The pH was measured in a 1:2 (w/v) suspension with water; the electrical conductivity was measured in the saturation extract; sodium absorption ratio was calculated by the concentrations of the water-soluble Na, Ca, and Mg, and cation exchange capacity was determined employing the method ISO 23470. Soil available NO₃-N and NH₄-N were extracted with 1 M KCl and was determined by ultraviolet spectrometry and the sodium salicylate - sodium nitroprusside method, respectively; P was extracted with 0.5 M NaHCO₃, pH 8.5 and determined by the molybdenum blue-ascorbic acid method, whereas K, Ca and Mg were extracted with 1 M CH₃COONH₄, pH 7; K was determined by flame photometry and Ca and Mg by atomic absorption spectrometry. Soil available Cu, Zn, Fe and Mn were extracted with DTPA and were determined by atomic absorption spectrometry and B was extracted with hot water and determined by the azomethine-H method.

Fertilization treatments: The pilot cultivation of *C. diae* followed weekly fertilization treatments using water (control), chemical, and INM in liquid or soluble granule form administered with foliar and soil applications. The foliar applications were performed using a 5 L plastic handheld sprayer (low pressure) until apparent wetness, and the soil applications were manually performed (100 mL nutrient solution per plant). The INM was supplied with four special fertilizers from THEOFRASTOS company, Industrial area of Korinthos, GR-20100 Korinthos, Greece. These semi-organic fertilizers are made from high quality edible raw materials and limited amounts of chemical solvents. More specifically:

- THEORUN is a nitrogen source liquid fertilizer with N 17 % (w/w) P₂O₅ 0 % (w/w) K₂O 1.5 % (w/w), organic matter 3.2 % (w/w), C/N 0.09, pH 9.1, diurea 0.26 %, electric conductivity 86 mS/cm [liquid extract (1 ‰)].

- THEOCAL is an organic calcium powder fertilizer which mainly contains calcium formate, pH 7.1, Ca 30 % (w/w) and organic matter 30 %. THEOFAST is a liquid plant growth enhancer including plant extracts of edible raw materials with organic matter 4.4 % (w/w) (plant extracts), pH 9.5 and electric conductivity 78 mS/cm [liquid extract (1 ‰)].
- THEOMASS is a liquid plant growth enhancer including plant extracts of edible raw materials with organic matter 5.4 % (w/w) (plant extracts), pH 9.4 and electric conductivity 85 mS/cm [liquid extract (1 ‰)].

The chemical fertilizers were all in soluble powder or granule form, except the liquid fertilizer for micronutrients (Plex Mix).

More information is provided by Paschalidis et al. [5] and Fanourakis et al. [6].