XVI ENCONTRO DE QUÍMICA DOS ALIMENTOS

Functionality assessment of *Scolymus hispanicus* (golden thistle) for its daily-basis incorporation in the Mediterranean diet

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Golden thistle (*Scolymus hispanicus* L.) is naturally distributed in the Mediterranean region. Its roots and fresh rosettes are traditionally consumed in soups and special meals, and have been reintroduced in some European countries since the consumption of native species is an integral and crucial part of the so-called Mediterranean diet; long associated with several beneficial health effects against diseases spread worldwide[1]. Although most of these native species are traditionally collected in the wild by the local communities, the increasing demand for such edible plants has created a market niche for the commercial exploitation of Wild Edible Plants (WEPs). This practice may fulfill consumer demands for product availability throughout the year, as well it prevents the risk for genetic erosion due to irrational gathering. There are reports, available in the literature, for cultivation practices of native species and how these practices may affect its nutritional profile, chemical composition, and bioactive compounds content[2]. The aim of the present study was to evaluate the effect of fertilization with nutrient solutions that contained different ratios of nitrogen (N), phosphorus (P), and potassium (K) on the nutritional profile (AOAC methods) of *S. hispanicus* edible plant parts. The mineral content was determined by atomic absorption spectrophotometry. Energy was calculated according to the equation: energy (kcal per 100 g) = 4 x (g protein + g carbohydrate) + 2 x (g total dietary fiber) + 9 x (g fat). The sample fertilized with 200:200:200 ppm of N:P:K (S222) stood out for its fiber content (40.7±0.2 g/100 g dry weight), followed by the sample S211 (fertilized with 200:100:100 ppm of N:P:K) that also showed promising crude protein values (10.8±0.3 g/100 g of dw); however, the crude protein content showed no significant differences between this sample (S211) and samples fertilized with 100:100:100 N:P:K (S111) and S222, respectively. The total dietary fiber content was different among the seven experimental treatments, which suggests the influence of the nutrient solution on this parameter. Sample S111 showed similar fat content to the control sample. The control sample (without fertilization) showed the highest levels in the majority of the studied parameters, except for fiber content, carbohydrates, and energy. The sample fertilized with 300 ppm of nitrogen had the lowest values in relation to fat, crude protein, and fiber contents. The energy calculation ranged from 301 to 285 kcal/100g of dry weight, while the sample with the highest energy value had the highest carbohydrate content. Mineral composition was affected by fertilization treatments for most of the minerals evaluated in the present study. Sample S311 (fertilized with 300:100:100 ppm of N:P:K) showed the highest amount of sodium, calcium, and magnesium and the lowest content of potassium and zinc. On the other hand, the control sample had the lowest amounts of sodium, magnesium, manganese and copper and the highest levels of potassium, iron, and zinc. Iron and other micro minerals are an essential part of many compounds in the oxygen transport and storage system and function as cofactors for enzymes[3]. It was possible to verify that the concentration of nitrogen, phosphorus and potassium in nutrient solution may directly affect the nutritional value and mineral content of the plant under study, with high concentrations of nitrogen presenting a negative impact on the protein content, indicating the low response of the species to increasing nitrogen fertilization rates. With the results obtained, it is possible to select the appropriate nutrient solution to obtain golden thistle with a promising nutritional profile and high mineral contents, as well as to promote its incorporation into commercial farming systems and the exploitation in a more sustainable manner through tailor-made fertilization regimes.

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XVI ENCONTRO DE QUÍMICA DOS ALIMENTOS

Crop rotation and irrigation regime affects the nutritional and chemical profile of *Cichorium spinosum*.

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The sustainable management of agricultural systems offers synergistic opportunities for the co-production of agricultural and natural capital outcomes.[1] A properly sized agricultural system is essential for the sustainable and ecological maintenance of crop productivity. Irrigation management is an important adaptation strategy to improve crop resilience to global climate change while crop rotation brings benefits such as increased crop yields through high soil fertility and reduced fertilizer inputs.[2] *Cichorium spinosum* L. (spiny chicory) is a wild edible plant that has received very recent attention as a potential alternative/complementary crop. It is a plant traditionally consumed in the so-called Mediterranean diet due to its high nutritional value and various beneficial health effects.[3] The study aims to improve and integrate the cultivation of this species in farming systems of the Mediterranean region. Thus, a combination of full or deficit irrigation with or without crop rotation with maize was established in an attempt to establish the commercial cultivation of spiny chicory. Two control samples were cultivated: C0 (rain-feed with crop rotation with maize) and C00 (rain-feed without crop rotation). The nutritional profile was evaluated using AOAC methods. Energy was calculated according to the equation: energy (kcal per 100 g) = 4 x (g protein + g carbohydrate) + 2 x (g total dietary fiber) + 9 x (g fat). The profile of organic acids, minerals, fatty acids and sugars were performed using UFLC-PDA, atomic absorption spectrophotometry, GC-FID and HPLC-RI, respectively. Although the impacts that a sustainable farming system generates on the crop involved is a long-term assessment and after the system has been repeated for several growing periods, however some changes are already noticeable in the first growing period. In the nutritional profile, there were no differences between the six experimental treatments, with the exception of the total dietary fiber content which samples C0 (control) and CFIC (full irrigation with crop rotation with maize) showed the highest levels. The samples presented low values of total fat, being the sample C0 the one that presented the highest value (3.5 g/100g dry weight). Promising levels of crude protein were indicated by all samples, however once again the control sample had the highest content (C00). The CFIC and CFIN samples (full irrigation with and without crop rotation, respectively) showed the lowest values of carbohydrates. The sample CDIC (deficit irrigation with crop rotation with maize) showed the highest energy (276.3 kcal/100g dry weight) probably due to the low fiber content and consequently the high carbohydrate content. Five organic acids were identified in the spiny chicory samples, mostly quinic acid, except in the CFIN sample in which oxalic acid had the highest concentration. In terms of minerals, the samples with full irrigation showed higher concentrations of iron, manganese and copper and lower calcium, while the samples without crop rotation showed lower concentrations of potassium. The predominant fatty acids identified and quantified were linolenic, linoleic, and palmitic acids, the sum of which represented 82 to 86% in the studied samples, while the sample with deficit irrigation and without crop rotation (CDIN) presented the lowest percentage. Finally, the sugars identified in higher concentrations were sucrose, glucose, fructose, and trehalose, respectively, however, it is suggested that crop rotation with maize altered the profile of sugars by increasing their concentrations. Considering that these are preliminary results, it was possible to point out positive impacts of the tested agronomic practices on nutritional parameters of the species that could be commercially applied aiming to integrate wild edible species in sustainable and low inputs farming systems.

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