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Effect of organic fertilization on fatty acid production and antidiabetic activity of *Portulaca oleracea* L.

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ABSTRACT

Portulaca oleracea L., commonly known as purslane, is a plant consumed in Europe, Asia and Africa, with nutraceutical compounds and essential fatty acids whose content exceeds that of vegetables such as spinach and lettuce. On the other hand, organic fertilization improves the physical-chemical characteristics of the soil and thus promotes growth, physiology and secondary metabolism, improving the chemical composition of the plant. In order to evaluate the effect of organic fertilization on fatty acid content and anti-diabetic activity (α-Glucosidase), greenhouse-grown plants were subjected to three treatments: control without additional fertilizers, with compost and vermicompost. The results indicated that vermicompost significantly increased oleic and linoleic acid content. However, palmitic acid content decreased, although other saturated fatty acids such as lauric, myristic and stearic acids did not show variations in the different treatments. Of the polyunsaturated essential fatty acids, linolenic acid (omega-3) increased in the control treatment. On the other hand, the enzyme α-Glucosidase did not show differences in the different fertilization treatments. However, its high percentage of inhibition (60 %) positions it as a species with high antidiabetic potential.
Keywords: Purslane, α-linolenic acid, linoleic acid, α-Glucosidase, organic amendments.

Efeito da adubação orgânica na produção de ácidos graxos e atividade antidiabética de *Portulaca oleracea* L.

RESUMO

Portulaca oleracea L., vulgarmente conhecida como beldroega, é uma planta consumida na Europa, Ásia e África, com compostos nutracêuticos e ácidos gordos essenciais cujo conteúdo excede o de vegetais como espinafre e alface. Por outro lado, a adubação orgânica melhora as características físico-químicas do solo e assim promove o crescimento, a fisiologia e o metabolismo secundário, melhorando a composição química da planta. Para avaliar o efeito da adubação orgânica no teor de ácidos graxos e na atividade antidiabética (α-Glucosidase),

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plantas cultivadas em casa de vegetação foram submetidas a três tratamentos: controle sem adubação adicional, com composto e vermicomposto. Os resultados indicaram que o vermicomposto aumentou significativamente o teor de ácido oleico e linoléico. Entretanto, o teor de ácido palmítico diminuiu, embora outros ácidos graxos saturados, como os ácidos láurico, mirístico e esteárico, não tenham apresentado variações nos diferentes tratamentos. Dos ácidos graxos essenciais poliinsaturados, o ácido linolênico (ômega-3) aumentou no tratamento de controle. Por outro lado, a enzima α-Glucosidase não apresentou diferenças nos diferentes tratamentos de fertilização. Contudo, a sua elevada percentagem de inibição (60 %) posiciona-a como uma espécie com elevado potencial antidiabético.
Palavras-chave: Beldroega, ácido alfa-linolênico, ácido linoléico, α-Glucosidase, aditivos orgânicos.

Efecto de la fertilización orgánica sobre la producción de ácidos grasos y la actividad antidiabética de *Portulaca oleracea* L.

RESUMEN

Portulaca oleracea L., comúnmente conocida como verdolaga, es una planta consumida en Europa, Asia y África, con compuestos nutracéuticos y ácidos grasos esenciales cuyo contenido supera al de vegetales como las espinacas y la lechuga. Por otro lado, la fertilización orgánica mejora las características físico-químicas del suelo y así favorece el crecimiento, la fisiología y el metabolismo secundario, mejorando la composición química de la planta. Para evaluar el efecto de la fertilización orgánica sobre el contenido de ácidos grasos y la actividad antidiabética (α-Glucosidasa), las plantas cultivadas en invernadero fueron sometidas a tres tratamientos: control sin fertilizantes adicionales, con compost y vermicompost. Los resultados indicaron que el vermicompost aumentó significativamente el contenido de ácido oleico y linoleico. Sin embargo, el contenido de ácido palmítico disminuyó, aunque otros ácidos grasos saturados como el láurico, mirístico y esteárico no mostraron variaciones en los diferentes tratamientos. De los ácidos grasos esenciales poliinsaturados, el ácido linolénico (omega-3) aumentó en el tratamiento de control. Por otro lado, la enzima α-Glucosidasa no mostró diferencias en los distintos tratamientos de fertilización. Sin embargo, su alto porcentaje de inhibición (60 %) la posiciona como una especie con alto potencial antidiabético.
Palabras clave: Verdolaga, ácido alfa-linolénico, ácido linoleico, α-Glucosidasa, enmiendas orgánicas.

INTRODUCTION

Currently, there is a growing demand for nutritional foods with bioactive properties beneficial to human health, especially those produced under sustainable management (FAO, 2022). In this regard, the therapeutic and nutritional properties of wild edible plants have been the subject of numerous studies (Vitalini *et al*., 2006; Pardo de Santayana *et al*., 2007), due to their high nutritional values and low energy values (Vitalini *et al*., 2006). Compared to their corresponding cultivated species, wild plants have a higher fiber content (Leonti, 2006).

Portulaca oleracea L., commonly known as purslane, is an annual succulent plant belonging to the Portulacaceae family. It is cultivated in various countries with warm and temperate climates, including Canada, Australia, New Zealand and countries of the American continent; because of this, it presents high edaphoclimatic adaptability (Iranshahy *et al*., 2017). It is appreciated for its medicinal properties due to its high content of antioxidants and phenolic compounds, which confers antimicrobial, reno and neuroprotective and anti-inflammatory action (Wang *et al*., 2007; Hozayen *et al*., 2011; Iranshahy *et al*., 2017; Gunenc *et al*., 2019). Also, its nutraceutical potential is due to the high concentration of health-promoting phytoconstituents such as proteins, vitamins and considerable amounts of dietary mineral elements such as copper, iron, manganese, potassium, calcium, magnesium and

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phosphorus (Xin *et al*., 2008; Yan *et al*., 2012; Uddin *et al*., 2014). In addition, it is an important source of specialized metabolites such as alkaloids, saponins, tannins, flavonoids, cardiac glycosides, terpenoids, flavonoids, beta carotenes and phenolic compounds (Kumar *et al*., 2022). Undoubtedly, its major nutraceutical importance lies in being a major producer of omega-3 fatty acids, in particular, essential fatty acids such as palmitoleic, palmitic, oleic, stearic, eicosapentaenoic and docosahexaenoic acids (Zhou *et al*., 2015; Petropoulos *et al*., 2016) whose content even exceeds that of mass-consumed vegetables such as spinach, red leaf lettuce, mustard and buttercrunch lettuce (Kumar *et al*., 2022). Of the polyunsaturated fatty acids found in purslane, linoleic acid (omega 6) and linolenic acid (omega 3) stand out, whose presence is highly beneficial especially for vegans and vegetarians whose diets generally lack them.

Bioactive compounds have a direct relationship with the antioxidant activity of plant organs and tissues, as they are part of the defense mechanism against exposure to free radicals, so their consumption reduces the incidence of coronary heart disease and cancer (Disciglio, 2017). On the other hand, its antidiabetic potential is given by the increase in insulin production. Studies in rats with type 2 diabetes mellitus showed that the activity of the enzyme α-Glucosidase increased insulin sensitivity, promoting glucose intolerance (Lan and Fu-er, 2003). Thus, crude polysaccharide extract obtained from the purslane plant has been shown to significantly reduce blood glucose levels and modulate lipid and glucose metabolism in adult patients with type 2 diabetes (Wainstein *et al*., 2016). Its action as a glycemia controller is due to its content of inhibitors of the enzyme α-Glucosidase that catabolizes into glycogen causing the decrease of D-glucose in the small intestine and attenuates postprandial hyperglycemia (Xiao *et al*., 2013; Romo-Perez A., 2022).

Although the content and concentration of bioactive compounds vary according to the phenological stage of the plant, there are factors such as fertilization as a source of nitrogen (N) and harvest time, which influence the obtainment of omega-3 fatty acids as well as oxalic acid (Páez, 2007; Oliveira *et al*., 2009; Uddin *et al*., 2014). Thus, organic fertilization becomes relevant to increase yields, improve chemical composition and promote plant growth. The management of biodegradable residues and their subsequent application to soil promote environmental sustainability and conservation (Zhou *et al*., 2022). By using biowaste as part of organic fertilization, a source of essential nutrients is provided to the soil, delivering optimal structure for plant development (Singh *et al*., 2018). Also, organic fertilization provides ecosystem services for the biodiversity of soil microorganisms as it increases the mineralization and availability of nutrients. It has been documented that organic fertilization

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in soil can increase mineralization and availability of nutrients such as N (Elzobair *et al*., 2016). In addition, it can improve soil health and reduce erosion as it improves root development and biomass, which translates into a positive impact on the sustainability of agricultural production (Kononova, 1996; Sorrenti *et al*., 2019). On the other hand, compost can improve the photosynthetic efficiency of the plant, increases fruit quality, and the concentration of anthocyanins and other phenolic compounds (Wang; Lin, 2003). Pinto-Morales *et al*. (2022), demonstrated that different doses of compost affect the physiological characteristics, total phenols, anthocyanins and antioxidant properties of calafate (*Berberis microphylla* G. Forst). Similarly, it has been estimated that chemical compounds in plant species such as fatty acids and antidiabetic activity may vary according to the source of organic fertilization (Mejri *et al*., 2020). With all this evidence, it has been proposed as a research objective to determine and compare the composition and concentration of fatty acids and antidiabetic activity on purslane grown with different organic fertilizers.

METHODOLOGY

Edaphoclimatic characterization of the study site

The study was carried out at the experimental station of the Universidad Adventista de Chile, commune of Chillán, Ñuble Region (36º31' S; 71º 54' W). The trial was conducted under greenhouse conditions from August to December 2019. The soil type where the trial was established is of volcanic origin classified as Typic Melanoxerand (Stolpe, 2006). The climate is temperate Mediterranean, with hot and dry summers, cold and wet winters and an average annual rainfall of 815 mm (Agrometerología, 2022).

Plant material

Portulaca oleracea was sown in nursery trays, with a substrate mixture of compost, peat and perlite in a 1:1:1 ratio. Emergence occurred 18 days after sowing. Subsequently, after 51 days, transplanting was carried out, considering a distance of 15 cm above the row and 20 m between rows. Weed control was done manually. Irrigation was through furrows, considering a standardized water replacement for all treatments, according to the daily potential evapotranspiration of the crop (ETc), using the methodology suggested by Romero *et al*. (2010).

Experimental design

A randomized complete block experimental design with three replications was established. The experimental units consisted of 0.6 m^2 plots. The factor to be analyzed corresponded to organic fertilization sources, with three levels: compost, vermicompost, and a

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control treatment. The dose of organic amendment applied was 20 kg m^{-2}. A chemical analysis was carried out on the organic fertilization sources used and on the soil of the trial. The analyses were carried out at the Soil and Plant Analysis Laboratory of the Universidad de Concepción (Chile), the values are shown in Table 1. Each experimental unit was harvested by cutting the foliage prior to flowering (45 days after transplanting).

Table 1 - Chemical analysis of organic amendments and soil (first 0.15 m depth).

Chemical parameters	Amendment types and control			
	Compost	Vermicompost	Soil (Control)	Unit
pH in water	7,06	5,3	4,71	
Organic Matter	21,6	12,61	11,14	%
Organic C	-	-	-	%
Total N	197,3	323,2	175,4	mg kg^{-1}
$N\text{-}NH_3$	-	-	-	mg kg^{-1}
$N\text{-}NO_3$	188,5	310,5	174,3	mg kg^{-1}
$N\text{-}NH_4$	8,9	12,7	1,1	mg kg^{-1}
Phosphorus Olsen	189,1	173,7	122,2	mg kg^{-1}
K Available	1.867	1.677,3	168,8	mg kg^{-1}
K Exchangeable	4,79	4,30	1,97	cmol kg^{-1}

Source: Created by the authors, 2023.

Obtaining *P. oleracea* extract

To obtain the extract, the aerial biomass of purslane was dried in a drying oven (BOV-T50F, BIOBASE, China) at a temperature of 60 °C for 48 h or until a constant weight was obtained. Twenty-five g of purslane powder was weighed and 300 mL of n-Hexane (95 %, Panreac, Barcelona, Spain) was added as solvent for extraction for 2 hrs. The lipid fraction was obtained using a rotary evaporator (R-300, Buchi, Switzerland) where hexane was evaporated to dryness and resuspended in 5 mL of hexane.

Determination of fatty acids from *P. Oleracea* by gas chromatography

It was performed through a GC-FID gas chromatograph (GC 2400 Platform, Perkin Elmer, USA), using method 108.003 of the Institute for Nutraceutical Advancement (USA), modified as described below. The sample was thoroughly mixed, melting the solid samples to ensure good homogenization, at a temperature not exceeding 60 °C. The temperature program consisted of 120 °C for 5 min, increasing the temperature at a rate of 10 °C min^{-1} to 180 °C, holding for 30 min, increasing again at a rate of 10 °C min^{-1} to 210 °C and holding for 21 min. The detector and injector temperature were 250 °C and the carrier gas flow rate was 33 psi. The identification of fatty acids was performed by a ratio with respect to the C16:0 fatty acid retention time.

Inhibition of α-glucosidase enzyme from *P. oleracea* extract

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Enzyme activity was assayed by determination of p-nitrophenyl hydrolysis according to Costamagna *et al*. (2016) with the following modifications. A sample of 170 µL of 0.1 M saline phosphate buffer (pH 7.5) and 25 µL of α-glucosidase enzyme solution (1 U mL^{-1}) was prepared and incubated at 37 °C for 20 min. The absorbance was determined on a multi-modal microplate reader (Synergy™ HTX, Agilent, USA). Reactions were initiated by adding 30 µL of 4-nitrophenyl-β -D-glucopyranoside (PNP-G) solution from concentrations 0.8 to 8.3 mmol L^{-1} reaching a final reaction volume of 250 µL. The absorbances were monitored kinetically at a wavelength of 405 nm every 1 min for 25 min at 37 °C.

The percentage inhibition of enzyme activity was calculated using the following equation: % Inhibition = [(An - Ai) - (An - As) / An] x 100

Where: An is the absorbance of the negative control (without extract), As is the absorbance with extraction solvent and Ai is the absorbance in the presence of the extract.

Statistical analysis

The difference between treatments was estimated by ANOVA and Tukey's test, after verification of the assumptions of normality and homogeneity of variance, with a significance level of 0.05. The Infostat software version 2021 (Di rienzo *et al*., 2013) was used for the analyses. Principal component analysis (PCA) and correlations were performed using mean-centered data based on eigenvalues using R software (RStudio, 2015) with the FactoMineR and ggplot2 packages (Kahle and Wickham, 2013).

RESULTS AND DISCUSSION

The fatty acid analysis indicated that the lipid profile corresponded to: linolenic acid (18:3 ω-3), linoleic acid (18:2 ω-6) and palmitic acid (16:0). Stearic (18:0), oleic (18:1), myristic (14:0), erucic (22:1) and lauric (12:0) fatty acids were also found, but in lower percentages (Table 2). In relation to the statistical analyses performed, there were significant differences in the content of these fatty acids according to the different treatments used ($p < 0.05$) (Table 2). The percentage of linolenic acid varied between 47.46 % and 41.26 %. The control treatment presented the highest percentages of this fatty acid. However, there were no significant differences between the compost and vermicompost treatments (Table 2).

Significant differences were found in the percentage of monounsaturated fatty acids; in this sense, vermicompost presented a higher percentage of monounsaturated fatty acids compared to the control treatment (16.72) and the compost treatment (8.30) (Table 3). On the other hand, polyunsaturated fatty acids did not show significant differences among the different treatments. Saturated fatty acids such as palmitic and stearic acid showed an increase

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in their concentration in the different treatments, the highest being found in the compost treatment (Table 3).

Table 2 - Fatty acid profile of *Portulaca oleracea* L, under different types of organic amendments. ω: omega types; C: carbons. Means with a different letter in rows are significantly different according to Tukey's test (p> 0.05). ± means standar error.

	ω	Fatty acids	Common name	Compost (% Fat)	Vermicompost (% Fat)	Control (% Fat)	*p*-values
pC12:0	-	Dodecanoic	Lauric	0.55 ± 0.025 a	0.27 ± 0.40 a	0.52 ± 0.08 a	0.8317
C14:0	-	Tetradecanoic	Myristic	0.37 ± a	-	1.87 ± a	0.5678
C16:0	-	Hexadecanoic	Palmitic	19.51 ± 11.2 a	11.1 ± 2.8 b	17.39 ± 9.9 a	0.0052
C18:0	-	Octadecanoic	Stearic	5.25 ± 1.2 a	2.45 ± 2.7 a	4.55 ± 3.1 a	0.2720
C18:1	-	Octadecanoic (Cis)	Oleic	5.78 ± 3.5 b	9.64 ± 0.9 a	6.72 ± 1.2 ab	0.0071
C18:2	-	Octadecanoic (Cis)	Linoleic	17.49 ± 1.4 b	21.28 ± 5.6 a	13.43 ± 2.6 c	0.0090
C18:3	-	Octadecatrienoic	Linolenic	43.39 ± 2.4 b	42.26 ± 3.7 b	47.46 ± 1.3 a	0.0030
C22:1	-	Docosaenoic	Erucic	2.70 ± 0.6 b	10.94 ± 4.3 a	9.16 ± 4.4 a	0.0005

Source: Created by the authors, 2023.

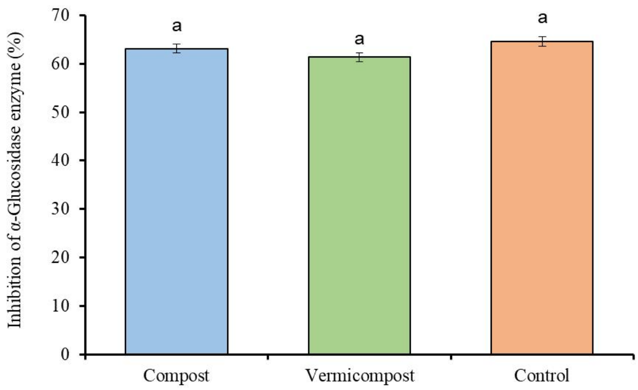
Table 3 - Fatty acid profile (%) saturated, monounsaturated, polyunsaturated by type of organic amendment used. Means with a different letter in rows are significantly different according to Tukey's test (p > 0.05). ± means standar error.

	Saturated	Monounsaturated	Polyunsaturates	Monounsaturated + Polyunsaturated
Compost	27,87 ± 0.5 a	8,30 ± 1.8 c	62,16 ± 0.6 a	70,46
Vermicompost	14,29 ± 1.3 c	20,79 ± 3.6 a	64,08 ± 1.1 a	84,87
Control	23,97± 1.9 b	16,72 ± 2.6 b	57,65 ± 1.4 a	74,37
p-values	0.0042	0.0039	0.2904	

Source: Created by the authors, 2023.

The α-Glucosidase enzyme did not show significant differences in the percentage of inhibition in the different treatments studied, reaching an average inhibition of 60 %, as shown in figure 1.

Figure 1 - Percentage inhibition of α-Glucosidase enzyme in the different treatments evaluated: Compost, Vermicompost and Control. Means with a common letter are not significantly different (p > 0.05).



Source: Created by the authors, 2023.

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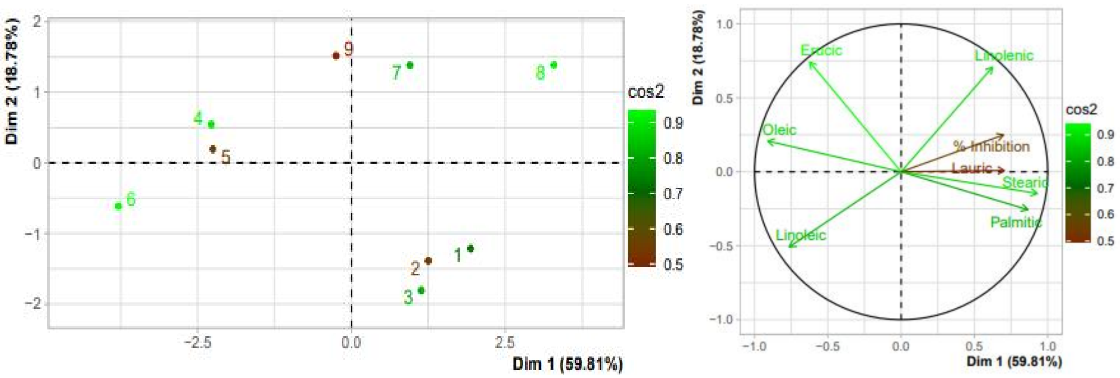
The principal component analysis (PCA) considered8 variables, corresponding to: percentage of inhibition of the enzyme α-Glucosidase, erucic, stearic, linoleic, palmitic, oleic, linolenic, lauric and myristic acids (Figure 2). The principal components PC1 and PC2 retained 59.81 % and 18.78 % of the variance, respectively. In the biplot, each parameter was represented as a vector, the length of which indicates its importance in the analysis (Figure 2a). Treatments are represented by numbers in the PCA (Figure 2b): 1-3 compost treatment; 4-6 vermicompost treatment and 7-9 control treatment.

Figure 2 - Principal component analysis (PCA), (a) between variables, (b) between individuals.



Source: Created by the authors, 2023.

The correlation matrix (Figure 3) corroborated the closeness between variables demonstrated in the PCAs (Figure 2a and b). Saturated acids correlated positively with each other, for example, lauric acid correlated with palmitic (r = 0.54) and stearic (r = 0.66) acids. On the other hand, palmitic acid correlated with stearic acid (r = 0.73). As for monounsaturated acids, they were positively correlated with each other, for example, oleic acid with linoleic (r = 0.63) and erucic (r = 0.69) acids. In contrast, among saturated and monounsaturated acids there was a high negative correlation between them, for example, stearic acid with erucic (r = -0.64), stearic acid with linoleic (r = -0.61), stearic acid with oleic (r = -0.94), palmitic acid with erucic (r = -0.82) and palmitic acid with oleic (r = -0.75), among others. As for the percentage of α-Glucosidase inhibition, this variable correlated positively with stearic (r = 0.61) and lauric (r = 0.6) acids, and weakly with linolenic (r = 0.42) and palmitic (r = 0.39) acids. On the other hand, the percentage inhibition of α-Glucosidase, had a negative association with linoleic (r = -0.53) and oleic (r = -0.59) acids.

On the other hand, the percentage inhibition of α-Glucosidase, had a negative association with linoleic (r = -0.53) and oleic (r = -0.59) acids. Of the fatty acid profile identified, oleic and linoleic acids increased with the vermicompost treatment (Table 2),

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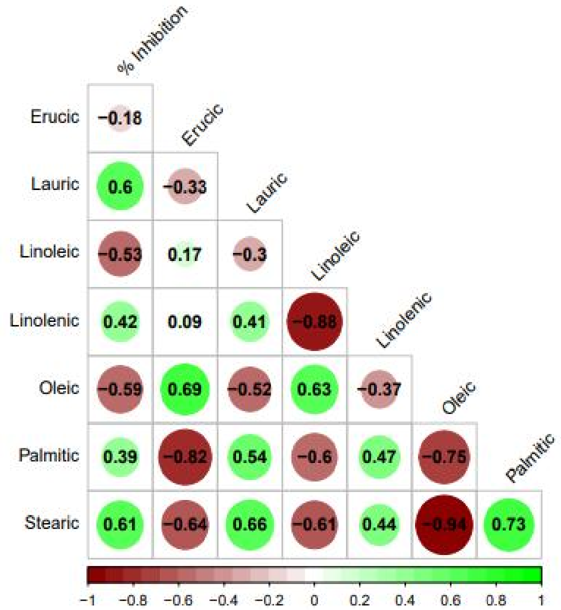
which presented high levels of available nutrients such as P, K, and mainly available N as N-NO_3 with respect to the other treatments (Table 1). It has been indicated that organic matter (OM) and available soil nutrients such as N, P, and K favor the production of these acids (Takahashi., *et al* 2001; Arif *et al*., 2017; Montoya-García *et al*., 2018). However, there was lower palmitic acid content when vermicompost was applied (Table 2). This would indicate that high doses of available N in the soil can inhibit certain acids, as happened in *Juglans regia* L. (Crews *et al*., 2005; Verardo *et al*., 2013).

Figure 3 - Correlation matrix between variables: percentage inhibition of α-Glucosidase enzyme, erucic, stearic, linoleic, palmitic, oleic, linolenic, lauric and myristic acids.



Source: Created by the authors, 2023.

Saturated fatty acids, such as lauric, myristic and stearic acids, did not evidence variations due to the organic fertilization used. Therefore, it is likely that the saturated fatty acids content is influenced by environmental factors not considered in this study; such as temperature or soil moisture (Serra *et al*., 2019). However, further studies are required to corroborate this finding.

A contrary result was obtained with linolenic acid or omega-3, which decreased in the treatments with organic fertilizers while increased in the control treatment. In this sense, omega-3 fatty acid production in plants could be influenced by factors such as plant genetics, environmental conditions (light, temperature, water), and internal plant metabolic processes (Chen *et al*., 2014; Kanbar *et al*., 2023). Organic fertilization could indirectly influence omega-3 fatty acid production by providing essential nutrients for plant growth and development, but there is no conclusive evidence that organic fertilization has a significant

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impact on omega-3 fatty acid production in purslane. This acid is of high importance in human health due to its characterization as an omega-3 fatty acid, which is essential for humans because it cannot be synthesized. It is the precursor of the longer chain omega-3 fatty acids, eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA) and docosahexaenoic acid (DHA), found predominantly in marine organisms, which have been attributed a wide range of health benefits (Liu *et al*., 2000).

The inhibitory capacity of the enzyme α-Glucosidase did not show significant differences in the treatments; however, it presents a high value over 60 % which translates into a species with high antidiabetic potential. Species such as *Fagopyrum esculentum*, *Hylocereus megalanthus*, *Senecio angulifolius*, *Smilax* sp. that have shown a high inhibitory capacity of the enzyme in comparison with the positive control quercetin allows attributing to them an antidiabetic property since postprandial hypoglycemia has been proved (Han *et al*., 2023; Coral *et al*., 2020; Romo- Pérez *et al*. 2022). It has been evidenced that antidiabetic activity is associated with the content of polyphenols present in a species.

In addition to the above, the high content of phenolic compounds presents in Purslane such as caffeic acid, p-coumaric acid, ferulic acid, gallic acid, vanillic acid, and syringic acid among others have been reported (Iranshahy *et al*., 2017), and some with glucosidase inhibitory capacity such as quercetin, isoquercetin and proanthocyanidin B2 (Li *et al*., 2009; Han *et al*., 2018; Lee *et al*.,2012).

It has been documented that different doses and sources of fertilization influence the number of polyphenols and antioxidant capacity of the species (Pinto-Morales *et al*., 2022), however, in our study, it seems that the different types of fertilization had no effect on the antidiabetic activity of *P. oleracea*, showing that this activity is an intrinsic property of the species (Kumar *et al*., 2022). In addition, it should be noted that the control soil had high fertility with an OM of 11.14 % and N of 174 mg kg^{-1}, which would generate sufficient nutrient availability for extraction by the plant for its physiological processes and accumulation of secondary metabolites (Pinto-Morales *et al*., 2022).

The high retention of PC1 principal components (59.81 %) (Figure 3) in our study was mainly due to the high positive correlation between saturated fatty acids as well as unsaturated fatty acids (Figure 4). It has been shown that these acids interact closely with each other and are used for the synthesis of plastids and other cell membranes in all plant cells. In addition, in certain plant tissues, especially seeds, they are used for the synthesis of reserve oils (Rawsthorne, 2002).

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On the other hand, we found a high negative correlation between monounsaturated and saturated fatty acids (Figure 4). In our study, linolenic fatty acid (monounsaturated) with an average of 44.37 % was the most abundant with respect to the other fatty acids in the different treatments evaluated (Table 2). This would indicate that as the monounsaturated fatty acids increased, mainly due to the high content of linolenic acid, it generated a decrease in the total content of saturated fatty acids. These results agree with those previously reported by Oliveira *et al*. (2009), where of the 27 fatty acids evaluated in purslane leaves, linolenic acid was the most abundant, with a range of 27.7 % to 39.1 %.

As for the inhibition of α-Glucosidase, this was not strongly influenced by the individual fatty acids, which was reflected in the moderate correlations found (Figure 3). Despite this, it has been demonstrated that these acids, as a whole, are essential for plant tissues, as well as, for the human organism fulfilling a significant role since they act as anti-inflammatory, antinociceptive, and anticarcinogenic, improving the functioning of the cardiovascular system (Petropoulos *et al*., 2016), therefore, their role as glycemia controllers would be rather indirect. On the other hand, it is understood that it is the polyphenols present in purslane that act strongly as glycemia controllers in the human body, since they contain inhibitors of the enzyme α-Glucosidase that catabolizes glycogen and decreases D-glucose (Xiao *et al*., 2013).

CONCLUSION

The effect of organic fertilization on the production of fatty acids in *Portulaca oleraceae* was differential for essential fatty acids, since compounds such as linoleic and oleic acid were increased with the application of vermicompost. However, palmitic acid decreased in this substrate. In the case of saturated fatty acids such as lauric, myristic and stearic acids, there was no effect of the type of fertilization and linoleic acid even decreased.

The activity of the enzyme glucosidase was not affected by the type of fertilization; however, it presented a high percentage of inhibition, which validates the species as a powerful antidiabetic.

Finally, it is proved that Purslane is rich in omega-3 fatty acids essential for human health and whose dilowed to obtain it mainly from fish, thus reducing the pressure on the marine ecology avoiding overfishing, also enhancing the resource in vegetarians and vegans, an increasingly common population nowadays.

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