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Characterization and evaluation *anti-diabetic, anti-inflammatory activity* [Effect of oral administration of *Portulaca oleracea* fractions in serum enzymes in rats] in experimental animals and screening its seeds components

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ABSTRACT

Volatiles are great markers of the item's origin, thus allowing us to assess its quality. Low precursors levels are likely to be present during the early stages of plant maturity when levels of aroma volatiles are low and maintained to the desired levels for the subsequent maturity stages. Several main and secondary metabolites were isolated from the seeds of *Portulaca oleracea*, which are crucial in the context of better human nutrition. The shade dried leaves of different plantlets were ground to make seed powder of *Portulaca oleracea*. Put 100 grammes of powder into a soxhlet apparatus and set it up for 8 hours of continuous hot percolation in 350 millilitres of methanol. First we created a semi-solid paste by the process of vacuum-forming the mixture. Then, we used a desiccator to remove any remaining solvent. In vivo experimental study was performed using laboratory rats on the effects of oral administration of the *Portulaca oleracea* extract on the serum enzymes SGPT, SGOT and ALP which were found to be important. Recorded (83.09 ± 2.06 , 141.74 ± 5.70 and 60.00 ± 1.75) respectively for *Portulaca oleracea* methanol extract, while (99.04 ± 3.08 , 161.03 ± 6.39 and 65.45 ± 2.00) were recorded respectively for using Di-(2-ethylhexyl) phthalate and (42.81 ± 1.00 , 60.08 ± 1.89 and 15.27 ± 0.18) were recorded to Control (vehicle) (0.5 ml/kg Corn oil). *Portulaca oleracea* fractions' inhibitory efficacy against α -amylase and α -glucosidase activity: *Portulaca oleracea* had considerable *anti*- α -amylase and *anti*- α -glucosidase activities. It was noted that the enzymatic inhibitor assay of the *Portulaca oleracea* fractions showed that the inhibition activity was influenced by both the fraction as well as dose. The highest dose which was being examined had the highest inhibition and the lowest dose had the least inhibition. According to the type of extract (Crude extract, ethyl acetate fraction, Ethanol fraction, Water fraction and acarbose (Standard) recorded (89.00 ± 2.05 , 34.57 ± 1.2 , 50.08 ± 1.30 , 71.05 ± 2.00 and 11.09 ± 0.10) respectively inhibitory potency against α -amylase. While recorded (65.08 ± 1.57 , 42.00 ± 1.50 , 31.00 ± 1.1 , 24.75 ± 0.29 , and 8.51 ± 0.09) respectively inhibitory potency against α -glucosidase activity. *Portulaca* extract has several bioactive compounds and their distinct pattern, thus, it has wide range of medical applications including as a natural *anti-diabetic*. In this work, the *anti-inflammatory* and *anti-hyperglycemic* effects of seed extracts of *Portulaca oleracea* were studied. These plant properties have *anti-inflammatory* effects, which are greatly influenced by the different chemical constituents. The extract of the seeds in standardised form can be therefore recommended for commercialization by food and pharmaceutical companies for antidiabetic applications.

Keywords: *Portulaca oleracea*, Anti-Diabetic, Anti-Inflammatory, Experimental Animals, Components, Oral administration

Introduction

Plants have a large variety of secondary metabolites and other biochemical constituents, and more than 80% of the population of the world relies on plant medicines for first aid (WHO, 2008). Plants make bioactive phytochemicals which are the basis of their physiological activities and therefore their therapeutic properties for humans. In the case of nutraceutical and medicinal herbs that are not standardised, quality assurance is difficult to achieve in international trade (Qiao *et al.*, 2019) [1]. The traditional restoration system still practices and popularizes these products worldwide in order to lessen the harmfulness of synthetic pharmaceuticals and enhance health by minimizing symptoms. Commonly found purslane (*Portulaca oleracea* L.) and chickweed (*Portulaca quadrifida* L.) are succulent annual herbs and weeds of the family Portulacaceae. (Pereira *et al.*, 2009; Pastor *et al.*, 1997; Ackerman *et al.*, 2002) [2, 3, 4]. Medicinal herbs - they are used for a long time in many countries and are used as a food (soup, salad and pickle). *P. oleracea* contains the highest amount of α -linolenic acid of any green on earth and has been used medicinally to treat a variety of gastroin

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testinal, respiratory and other disorders. Oral hypoglycemic agents that are the primary drugs used in type II diabetes are glucosidase inhibitors, biguanides and thiazolidinediones (TZDs). Oral hypoglycemic drugs are effective at controlling blood sugar levels, but may not prevent diabetic complications like nephropathy and cardiovascular disease, which can occur over time. In addition, acarbose's gastrointestinal problems, glibenclamide's granulocytopenia and hypoglycemia, and metformin's lactic acidosis are only a few of the major adverse effects that are commonly linked to these medications' long-term usage. A succulent herb that grows all over the globe and thrives in a wide variety of climates, purslane is an annual plant with leaves that can be either prostrate or upright, depending on the amount of light they get (Nadimi *et al.*, 2013; Anusha *et al.*, 2011) [5].

[6]. Purslane is a member of the Portulacaceae family, a C4 plant, one of the most useful medicinal plants and WHO has named it as a "Global Panacea". The effective ingredients are alkaloids, polysaccharides, flavonoids and coumarin. A versatile crop rich in antioxidant vitamins and omega-3 fatty acids. It has several medicinal applications such as prevention of cardiovascular diseases and a strong immune system (Zhao *et al.*, 2015; Asemi *et al.*, 2013; Erkan, 2012) [7, 8, 9]. It is known to possess antioxidant, anti-inflammatory and antibacterial properties, and it regulates lipid and sugar metabolism in the body (Meng *et al.*, 2016) [10]. Furthermore, the aqueous extract of *Portulaca oleracea* has also been shown to be anti-diabetic and anti-inflammatory in the diabetic endothelium in type II diabetic mice, db/db mice.



Figure 1. *Portulaca Oleracea* Seeds (Purslane Seeds).

Materials and methods

The samples: prepared and analyzed using GCMS

The seeds were rinsed with tap water, then let to dry in the shade. They were then mechanically pulverised and shaken for two days at ambient temperature at 150 rpm in methanol in a shaking machine. The filtrate was evaporated and utilised in the experiments after passing it through Whatmann no. 1. Phytochemical analysis of syringe-filtered methanol extracts (5 mg/ml) of *P. oleracea* was done using a GCMS system composed of a gas chromatograph and a mass spectrometer. During the course of 21 minutes, the oven temperature was gradually increased from 60 °C (3 minutes) to 280 °C (15 minutes). Helium gas was flowing at a rate of 1.21 mL per minute. The ion source and interface temperature were set to 230 and 270 °C, respectively, in the GC programme and the time required for solvent cut was 3.50 minutes. The chromatographic conditions such as injector temperature (260 degrees Celsius) and column oven temperature (60 degrees Celsius), linear velocity (40.1 cm/sec), injection split ratio (10.0), and pressure (73.3 kPa) were all optimized. Mass spectrometry scan range was 40-650 m/z and mass spectra time 4-49.98 minutes. To identify unknown bioactive phytochemicals, the mass spectrum databases in New York (Wiley) and the NIST library (with more than 62,000 mass spectra) were consulted.

A-Amylase inhibitory assay

The conventional method was slightly modified to determine the inhibition of α -amylase activity of the extract and fractions. Two hundred millilitres of sample α -amylase (2 international units per millilitre) was followed by twenty millilitres of extract and fractions between half a milligramme per millilitre. Finally 500mls of 100mM 6.8 phosphate buffer were added. The mixture was then divided among 96 wells and kept at 37 °C for 20 minutes. The temperature for the incubation was determined during the preincubation process to be 37 °C. The above mixture was again placed in an incubator at 37 degrees Celsius after 30 minutes. Plus, 20 litres of a 1% soluble starch solution in a 100 mM phosphate buffer at a pH of 6.8 was added. The amount of DNS colour reagent added to the liquid was 100 litres and it was kept in liquid for 10 minutes under constant pressure. The final mixture was supposed to have an absorbance measured. The concentrations used as control level were standard concentrations of acarbose (0.1-0.5 mg/ml). A material, which was not synthesized by any experimental procedure (extracts and fractions), was synthesized simultaneously as a comparator. In this case, the three trials of each experiment were performed. The results were given as percentage inhibition based on the outcome of applying the formula. Graphical examination of the enzyme activity inhibition by the different quantities of the fractions was used to determine the IC₅₀ values.

α -Glucosidase Inhibitory Assay

Analysed was the extract and fractions' inhibitory effect on α -glucosidase. If no, the analysis was carried out following the standard tech

nique, but with a few minor tweaks. To prepare, the serum samples were pre-cooled in a 96-well plate for 15 minutes at 37 °C. The pre-incubation temperature was 37 °C. The mixture was then incubated for another 20 minutes at 37 °C. Subsequently, the 20 litres of *P*-NPG (five millimolar concentration) was used as a substrate. This reaction was stopped when 50L of 0.1M sodium carbonate solution was added. In this experiment, the absorption of the newly released nitrophenol

was actually calculated using a multiplate reader and measuring the wavelength at 405 nm. Acarbose (0.5 mg/mL) was used as a standard amount in this sample. We conducted each of these 3 or 4 times to compare results with others. Also, at the same time, a control experiment was run without the chemical that was being studied. The percentage of inhibition was used to calculate the inhibitory activity of α -glucosidase as expressed below:

$$\% \text{ Inhibition} = \frac{\text{Abs}_{\text{control}} - \text{Abs}_{\text{extract}}}{\text{Abs}_{\text{control}}} \times 100$$

The symbols A control and A extract are the absorbance of the control and fractions, respectively.

Experimental animals

The experiments were performed on normal male Albino rats of weight range 175 - 225 grammes. They were housed in polypropylene tanks and given a standard laboratory diet with unlimited access to water. The temperature in the room ranged from 24 °C to 3 °C. Rats were first habituated to the lab for at least 8 hrs prior to the studies.

The administration of drugs and animals

The animal breeding house was the source for the animals. They were kept in a normal rat room (23 °C±3, 55-70%RH, 12/12L:D) and fed with a standard rat diet with sufficient ventilation in their cages. There were 12 rats in total: 3 groups of 4. The 100 mg/kg of Di-(2-ethylhexyl) phthalate was administered to animals in Group I as a positive control while animals in Group II received normal saline as a sham control. Maize oil was used as vehicle control in all the tests done on the methanol fraction of *Portulaca oleracea*. Di(2-ethylhexyl) phthalate was given to Group 1 at a dose rate of 100 mg/Kg and fractions of *Portulaca oleracea* were given to Group 2 and 3 at rates 0.50 and 0.75 mL/Kg respectively.

The percentage of inhibition could be determined by applying the following formula:

$$\% \text{ Inhibition} = (\text{Abs}_{\text{control}} - \text{Abs}_{\text{extract}}) / \text{Abs}_{\text{control}} \times 100$$

Statistical analysis

Software developed and maintained by GraphPad in the United States of America (GraphPad Prism5) was used to conduct the statistical analysis. The data was analysed using one-way ANOVA and Bonferroni test. Mean $\pm$ standard error mean was used to express the in vitro research of IC₅₀ values for triplicate determination. Free radical activities were reported as percentage and phytochemicals were identified as mean $\pm$ SD. Statistical tests of differences in indicators were deemed to have been considered if the results had a *p*-value < 0.05.

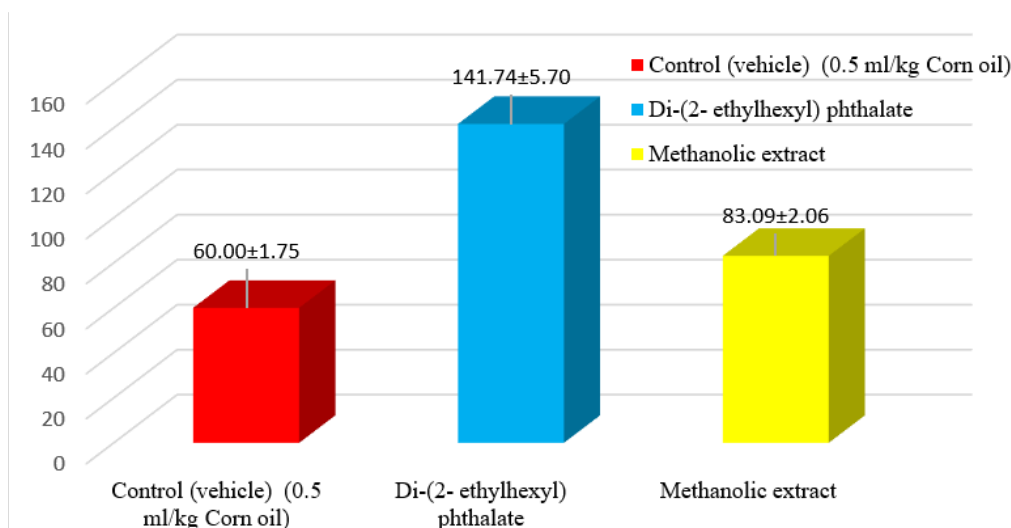
Results and discussion

While transcriptome and proteome research have been documented and whole genomes have been sequenced for many animals, metabolome analysis utilising mass spectrometry (MS)-based technologies have just lately garnered interest. The complicated metabolism of an organism can now be studied by using modern analytical tools (Zhou *et al.*, 2015; Rahdari *et al.*, 2012; Lee *et al.*, 2012) [11, 12, 13]. Metabolomics is a powerful tool for characterising metabolites and metabolic pathways in its quest to capture a "snapshot" of the biochemical status of a biological sample. The number of metabolites will be expected to be much smaller than the number of genes, proteins or mRNAs in the sample, when the complexity is reduced. This is a formidable task to list all metabolites as the total number of metabolites in the plant kingdom is estimated to be 100,000 to 200,000. Variations in metabolic composition of plants, caused by different plant genetic backgrounds, changes in physiology and environment, are expected (Cheng *et al.*, 2012; El-Sayed, 2011) [14, 15]. Under specific conditions, the objective of metabolomics is to provide a comprehensive unbiased analysis of low molecular weight metabolites found within a biological sample, such as a cell, tissue or organism. Analytical approaches for the analysis of metabolites in plants can be chosen among the numerous options of metabolic profiling, metabolic

target analysis and metabolic fingerprinting (Kumar *et al.*, 2022) [16] depending on the research question or study focus. The aim of metabolite profiling is to find all metabolites belonging to a certain, well-defined class of metabolites (carbohydrates, organic acids or amino acids). The goal of metabolic profiling is to find relative amounts of metabolites rather than their absolute concentrations. However, targeted metabolite analysis employs specialised extraction methods and separation/detection technologies to determine the pool sizes of metabolites involved in a particular pathway. The third theoretical approach to metabolome analysis is metabolic fingerprinting, which does not attempt to identify metabolites specifically, but provides a "fingerprint" of all metabolites that can be measured, in order to use non-specific, fast analysis of crude metabolite mixtures for discrimination and comparison of samples. Depending on the method used for the analysis, a number of different experimental platforms may be needed to ensure optimum data collection is achieved. Metabolites come in a wide variety of structural classes; some are simple, like carbohydrates, amino acids, and organic acids; others are more complex, like phenolics and terpenoids. So, no one single methodology can measure the entire metabolome in one go. However, a set of techniques is needed to identify all metabolites in a complex mixture (Zare *et al.*, 2020; Jalali *et al.*, 2022) [17, 18]. It's possible for two samples that look very different to generate the same metabolite profile. Thus, only a combination of a variety of instrument platforms and methods can reveal the suite of variations in metabolite profiles. The major phytochemicals found in the seeds were cis-9-Octadecenoic acid, alpha-Tocopherol quinol, cis-11-Eicosenoic acid methyl ester, 1H-Inden-1-one, 2,3-dihydro-5-hydroxy, 3-tert-Butyl-4-hydroxyanisole, Cyclohexane, tetradecyl, n-Hexadecanoic acid, 2-Methoxy-4-vinylphenol, 2-Hydroxycyclopenta-decanone, 27-Norcholestan-3,7,12,24,25,26-hexol, Olean-12-ene-3,28-diol, and Bis(2-ethylhexyl) phthalate.

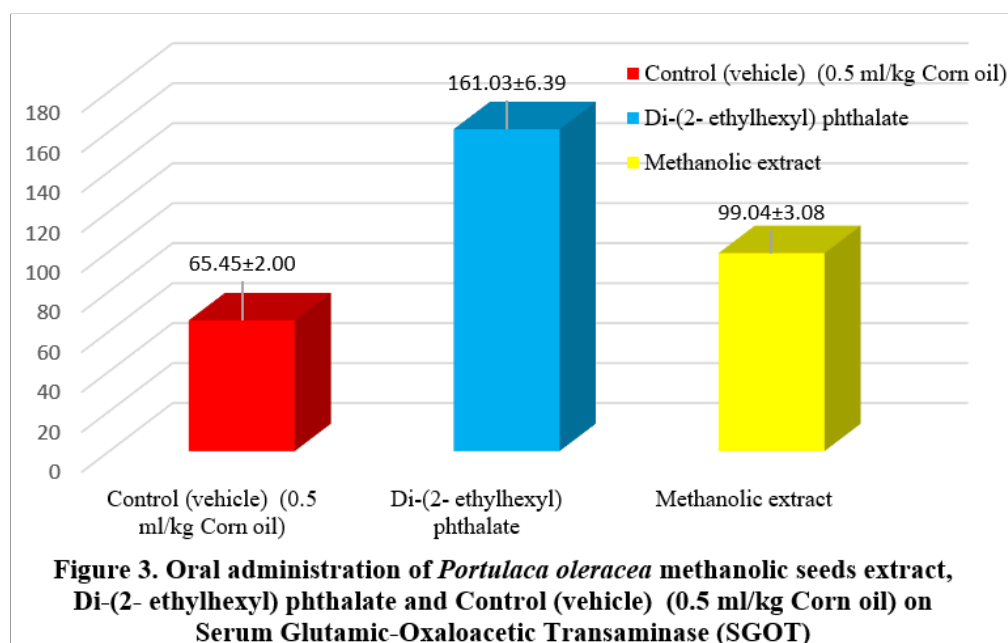
Table 1. The extraction of the seed's components of *Portulaca oleracea*.

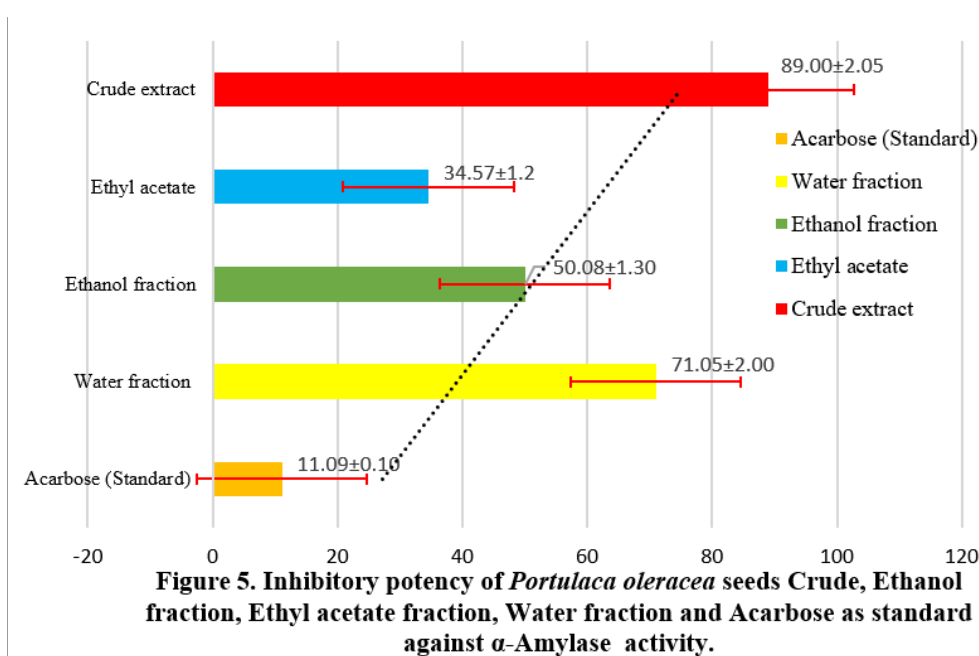
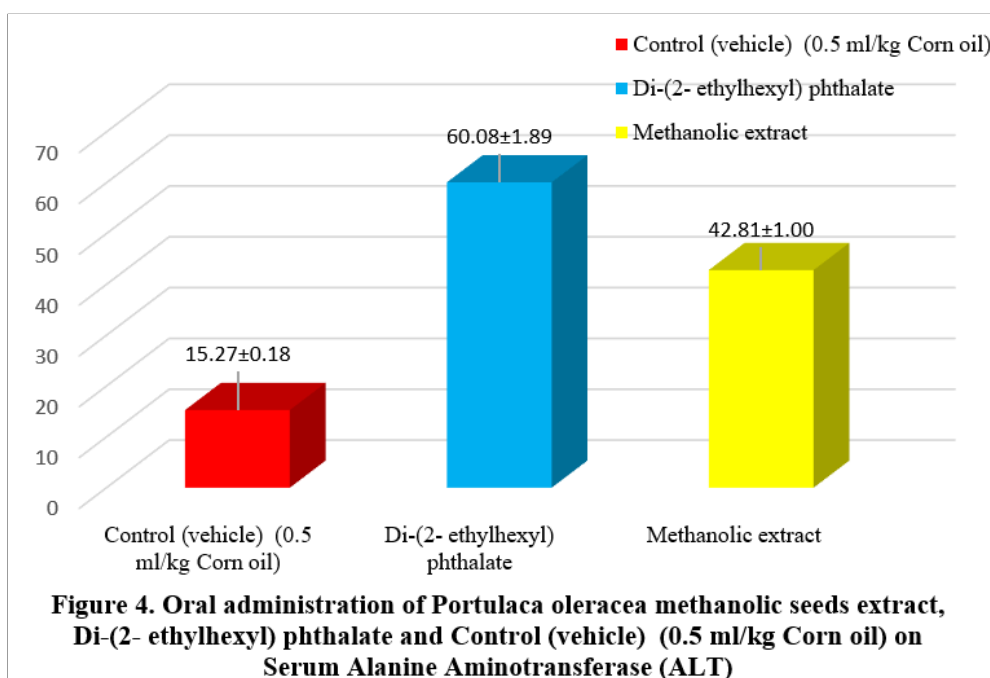
Compounds	Molecular Formula	Molecular Weight	Compounds	Molecular Formula	Molecular Weight
cis-9-Octadecenoic acid	C ₁₈ H ₃₂ O ₂	296.4 g/mol	alpha-Tocopherol quinol	C ₂₅ H ₅₂ O ₃	448.7 g/mol
cis-11-Eicosenoic acid methyl ester	C ₂₁ H ₄₀ O ₂	324.5 g/mol	1H-Inden-1-one, 2,3-dihydro-5-hydroxy	C ₉ H ₈ O ₂	148.16 g/mol
3-tert-Butyl-4-hydroxyanisole	C ₁₁ H ₁₆ O ₂	180.24 g/mol	Cyclohexane, tetradecyl-	C ₂₀ H ₄₀	280.5 g/mol
n-Hexadecanoic acid	C ₂₁ H ₄₆ O ₂ Si ₂	386.8 g/mol	2-Methoxy-4-vinylphenol	C ₉ H ₁₀ O ₂	150.17 g/mol
2-Hydroxycyclopentadecanone	C ₁₅ H ₂₈ O ₂	240.38 g/mol	27-Norcholestan-3,7,12,24,25,26-hexol	C ₂₆ H ₄₆ O ₆	454.6 g/mol
Olean-12-ene-3,28-diol	C ₃₀ H ₅₀ O	442.7 g/mol	Bis(2-ethylhexyl) phthalate	C ₂₄ H ₃₈ O ₄	394.6 g/mol

**Figure 2.** Oral administration of *Portulaca oleracea* methanolic extract, Di-(2-ethylhexyl) phthalate and Control (vehicle) (0.5 ml/kg Corn oil) on Serum Glutamic-Pyruvic Transaminase (SGPT)

In vivo experimental studies were conducted on laboratory rats to evaluate the effect of an oral dose of *Portulaca oleracea* extract on the blood enzymes, SGPT, SGOT and ALP. The results for the *Portulaca oleracea* methanol extract were 83.09 ± 2.06, 141.74 ± 5.70, and 60.00 ± 1.75 respectively. In contrast, the results for the

Di-(2-ethylhexyl) phthalate were 99.04 ± 3.08, 161.03 ± 6.39, and 65.45 ± 2.00, and the results for the Control (vehicle) (0.5 ml/kg Corn oil) were 42.81 ± 1.00, 60.08 ± 1.89, and 15.27 ± 0.18. In Figures 2, 3, and 4.

**Figure 3.** Oral administration of *Portulaca oleracea* methanolic seeds extract, Di-(2-ethylhexyl) phthalate and Control (vehicle) (0.5 ml/kg Corn oil) on Serum Glutamic-Oxaloacetic Transaminase (SGOT)

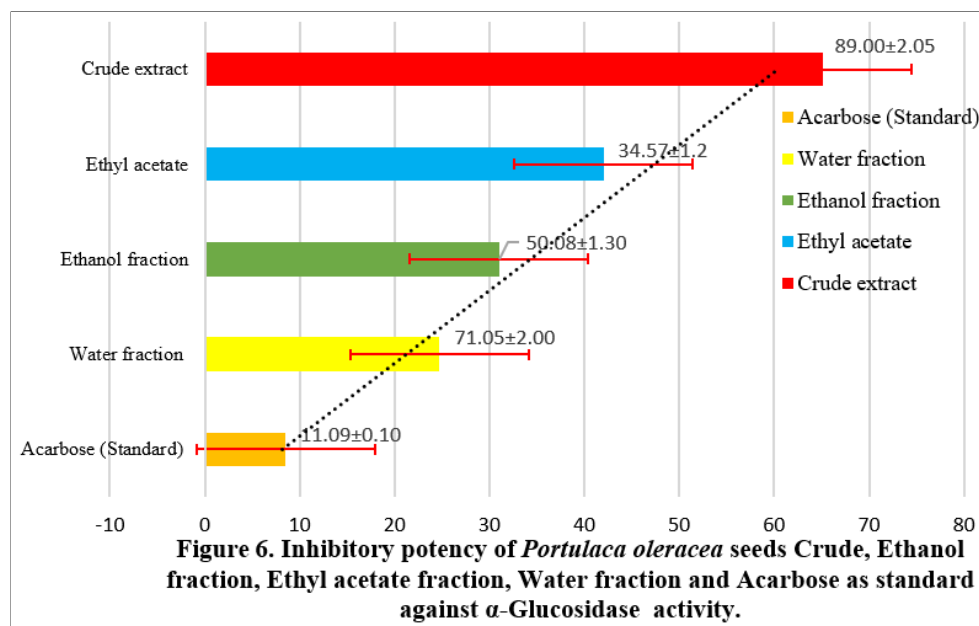


As per the above figures, it can be clearly depicted that the *anti-α-amylase* and *anti-α-glucosidase* activity of *P. oleracea* fractions is seen to be effective. The results of enzymatic inhibitor assays indicated that both the fraction and the dosage had an effect on the activities of the *Portulaca oleracea* fractions. The highest dose tested caused the highest level of inhibition, and the lowest dose caused the lowest level of inhibition. The inhibitory potency against α-amylase was found to be 89.00 ± 2.05 , 34.57 ± 1.2 , 50.08 ± 1.30 , 71.05 ± 2.00 and 11.09 ± 0.10 for the various kinds of extract (Crude extract, ethyl acetate fraction, ethanol fraction, water fraction and acarbose (Standard)). The inhibitory potency against α-glucosidase activity was measured to be 6.50 ± 1.57 , 42.000 ± 1.50 , 31.000 ± 1.1 , 24.75 ± 0.29 , and 8.51 ± 0.09 correspondingly. Due to the presence of polyunsaturated fatty acid, vitamins and polysaccharides in the purslane seeds, they are claimed to be beneficial in weight loss, insulin sensitivity, blood lipids, blood sugar, and liver protection. The hypoglycemic and hypolipidemic effects of purslane have been suggested in multiple studies to have the potential to greatly ameliorate the symptoms of non-alcoholic fatty liver steatosis. Studies (Ghefati *et al.*, 2019; Bartelt *et al.*, 2011) [19, 20] have found that obesity and the hormonal changes that occur as a result are linked with reductions

in fatty acid oxidation and blood sugar levels, as well as endothelial dysfunction. These changes involve peripheral insulin resistance, increased production of leptin, decreased production of adiponectin by adipose tissue and increased insulin production. Adiponectin is one of the key factors that reduces insulin resistance and its levels are inversely proportional to fasting blood glucose levels. Purslane improves liver steatosis through a variety of ways, including weight loss, increased adiponectin levels, improved fatty acid oxidation and reduced insulin resistance. How insulin resistance and sirtuin levels were affected in rats with NAFLD when administered 400 mg/kg of purslane extract. After 8 weeks, a higher level of sirtuins was found in the blood, leading to a decrease in insulin resistance in NAFLD following purslane extract. However, in contrast to our study, we did not observe any significant alterations in the lipid profile, blood pressure, insulin, liver enzymes, total bilirubin and hepatic steatosis grading in the control group at the end of the trial period. After 12 weeks of Purslane Extract (3 capsules 180 mg/day), the body mass index (BMI) and weight of patients with type 2 diabetes were reduced. Purslane is known to affect weight gain and metabolism. All three, weight, body mass index (BMI) and waist circumference, may show improvements after five weeks of consuming 10 grammes daily of purslane seeds.

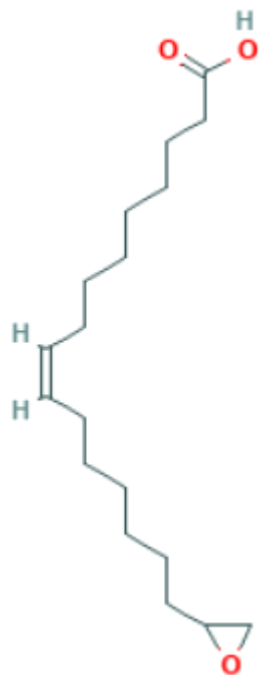
Supplementation with purslane greatly increased SOD levels in this study. Both catalase and GPx were significantly higher in the group that ate purslane. The 400 mg/kg of PAP extract per day to liver fibrosis induced rats showed significant reduction in AST, GGT, total bilirubin, MDA, and TNF- α and significant increase in SOD, CAT, GPx, and GSH levels. In a rat model of liver fibrosis-induced biliary obstruction, we have found that the purslane hydroethanolic extract has antioxidant properties, reduces the expression of profibrogenic cytokines, collagenolytic activity and activates hepatic stellate cells (Takeda *et al.*, 2020; Darvish Damavandi *et al.*, 2021; Ranaei *et al.*, 2022) [21, 22, 23]. The many effects of purslane include those on liver function, oxidative stress and inflammation as well as its well-known hypolipidemic properties. One of the mechanisms by which fresh

purslane could help to prevent liver damage from a high fat diet is by increasing (CYP7A1) and (Ldlr). Furthermore, in rats, the bioactive compounds found in purslane, such as omega-3 fatty acids and antioxidants, may help to boost antioxidant enzymes like glutathione peroxidase and catalase, which then combat oxidative stress, inflammation, and impaired liver function (Zeng *et al.*, 2022) [24]. Moreover, purslane (*P. oleracea* L.) has flavone which prevents the release of NO and regulates (*p*-PI3K) and (*p*-AKT) signalling pathways to inhibit inflammatory reactions. Purslane seed extracts exhibit anti-inflammatory properties by reducing the production of the inflammatory mediators TNF- α and IL-1 β via antioxidant mechanisms, particularly the methanol extract.

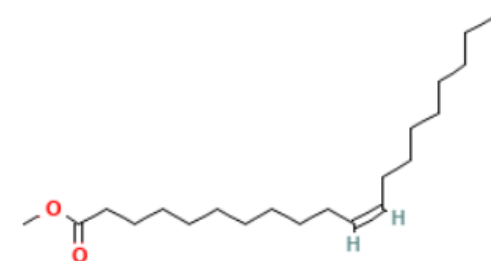


The inhibitory effects of methanol and ethanol fraction were significantly higher than acarbose ($P < 0.05$) in terms of % inhibition of α -glucosidase. More and more people are being disabled or die as a result of chronic inflammatory disorders. The immune system, which performs the main task of maintaining a balanced or physiological state for the body, of course, regulates inflammation. In addition to other endogenous stimuli (e.g., created by tissue injury), inflammation is involved in tissue repair in the body's defence against pathogens. There are a number of substances and mediators involved in this process. Macrophages, for example, generate cytokines such as (IL-6), (IL-1 β) and (TNF- α) that are pro-inflammatory. If the inflammatory response is not managed, sometimes acute inflammation can become chronic inflammation. Diseases like rheumatoid arthritis, cardiovascular disease, diabetes type 2, and neurological disorders could develop as a result of this. Moreover, there are significant evidence connecting inflammation to cancer, so that these pathogeny features should be the center of the studies in human clinical and scientific research. Non-steroidal *anti*-inflammatory drugs (NSAIDs) have been used as the first step in the treatment of inflammatory diseases, because they can inhibit the cyclooxygenases, which are enzymes that play a role in the production of powerful inflammatory mediators like prostaglandins (Chen *et al.*, 2022; Dong, 2023) [25, 26]. Finding safer

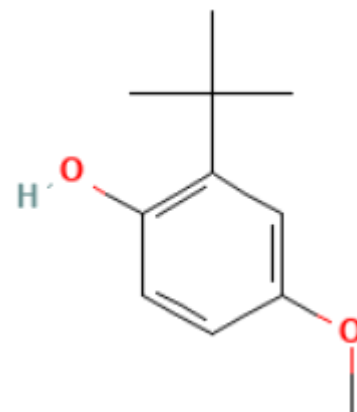
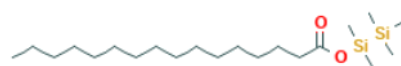
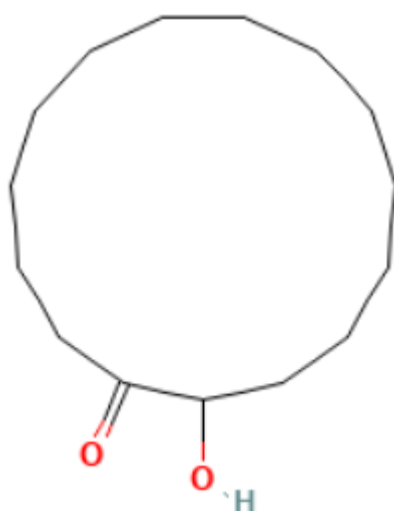
alternatives to NSAIDs is still a top priority, though, because: everyone knows that these medications can have harmful side effects, most notably in the areas of the digestive tract, the heart, and the kidneys (Wainstein *et al.*, 2016) [27]. Thus, the discovery of novel therapeutic molecules for both prevention and therapy of inflammatory diseases is the main focus of this work. Although much time and effort has been invested in these areas, research efforts are ongoing for improved and safer treatment medicines for inflammatory diseases in humans. This is because, so far, only small section of all the compounds that are potentially therapeutic or pharmaceutically relevant have been tested in humans (Esmailzadeh *et al.*, 2015; Mousa *et al.*, 2021; Dkhil *et al.*, 2011) [28, 29, 30]. Believe it or not, vegetables and their extracts contain a wealth of active substances which are believed to have the ability to cure, and even cure some illnesses. In addition to their high nutrient content, veggies include a number of phytochemicals that have medicinal potential. Water extract of broccoli has beneficial effects on hemodynamic changes, particularly on endothelial dysfunction, which is attributed to its antioxidant effects. In this disease, endothelial dysfunction, the first step in cardiovascular disease, is impaired, and the ability to regulate vascular tone is also impaired, possibly due to a decrease in nitric oxide (NO) bioavailability (Lu *et al.*, 2023) [31].



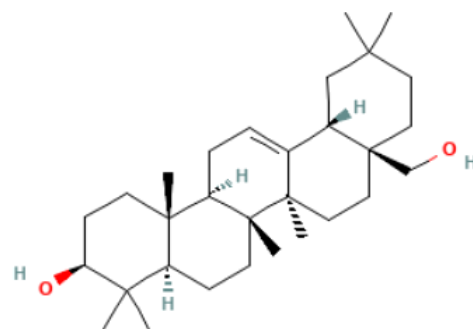
cis-9-Octadecenoic acid



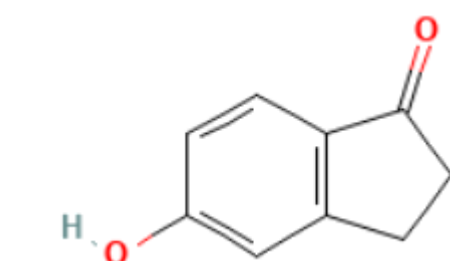
cis-11-Eicosenoic acid methyl ester

3-*tert*-Butyl-4-hydroxyanisole*n*-Hexadecanoic acid

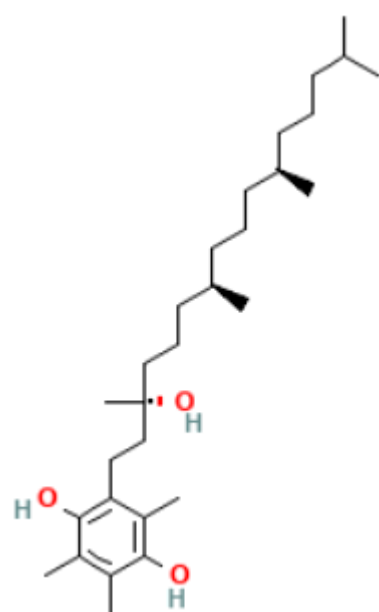
2-Hydroxycyclopentadecanone



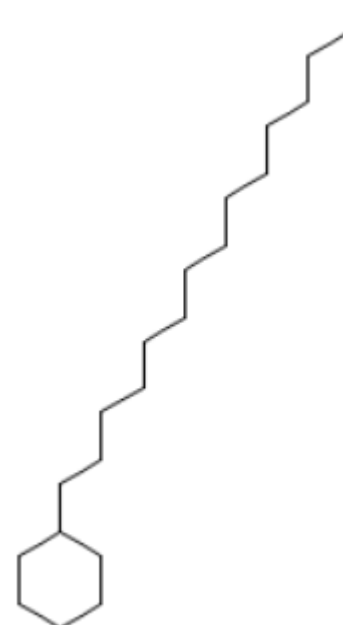
Olean-12-ene-3,28-diol



1H-Inden-1-one, 2,3-dihydro-5-hydroxy

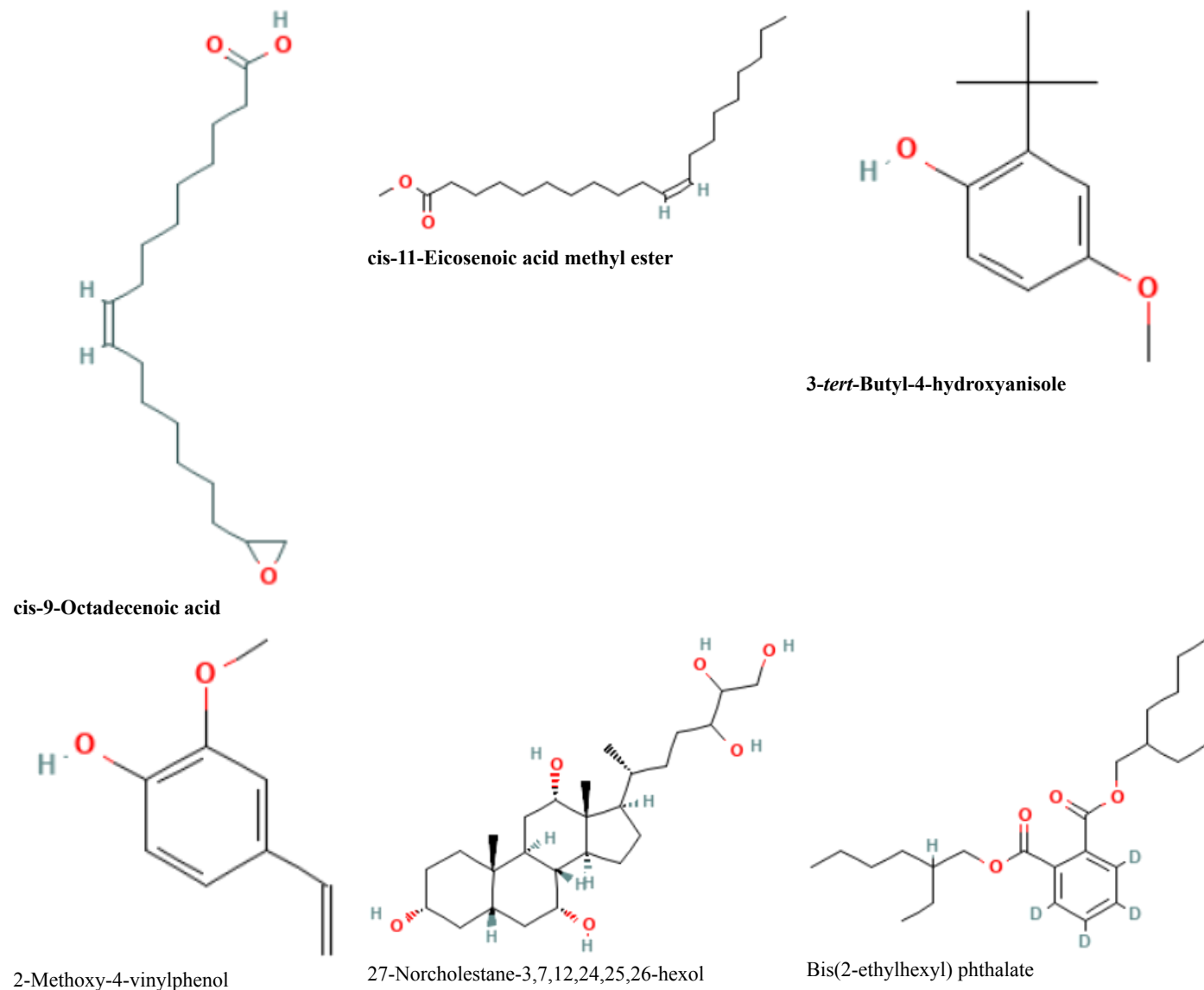


alpha-Tocopherol quinol



Cyclohexane, tetradecyl-

(continued on next page)



The antidiabetic effects of *Portulaca oleracea* may be attributed to inhibition of the amylase enzyme in the intestine, an increase in insulin level, or regeneration of pancreatic B cells. The antidiabetic activity of the extract might be influenced in various ways. One is by enhancing insulin secretion by the pancreatic islets of Langerhans, which in turn helps to distribute blood glucose more evenly. Another is, of course, by lowering the amount of glucose in the blood. We found that *Portulaca oleracea* ethanolic extract had a hypoglycemic effect, which is characterised by a precipitous drop in insulin and blood sugar levels. Remaining beta cells are spared from destruction and new beta cell maps are promoted by the insulin-tropic components of the extract (Ahmed *et al.*, 2022) [32]. When it affects humans, acute inflammation is usually short-lived, rapidly deteriorating, and occurs all of a sudden. Subacute inflammation is inflammation that persists for 2-6 weeks, but shorter than chronic inflammation. A low-grade inflammatory response (few hours to days) is another symptom of persistent inflammation (El-Sayed, 2011) [33]. One might suspect that inflammation would begin to cause problems in rats within six weeks, instead of six months, considering that they live about the same length of time as humans. The best and most reliable data they have is that acute can last for weeks, months or even years.

Conclusion

The polar extract of *Portulaca oleracea* was found to contain over 12 chemical compounds by GC-MS, with the phytosterols and other bioactive compounds in *P. oleracea* being the most important point to consider when understanding its medicinal and pharmacological uses. This crop has potential for ethnomedical use due to phytochemicals

identified and their potential biological roles. The results of the present study showed that extracts from different parts of *Portulaca oleracea* have significant *anti-inflammatory* and antidiabetic properties. The present study is also the first to demonstrate that *Portulaca oleracea* extracts, in both water and methanol, exhibit a dose related hypotensive effect in rat models, thereby providing a rationale for the use of this medicinal plant in medicinal treatments. The findings bring up the need for further research aimed at the characterization of the extracts molecular properties, elucidation of their biological profiles (identification and isolation of their main components) and of the mode of action of each extract. *Portulaca oleracea* and its major functional components require additional research for safety and efficacy for the various pathological conditions. Various studies have shown that consumption of purslane supplements has a beneficial effect on metabolic parameters such as lipid profiles, blood sugar, liver function and the reduction of inflammatory markers. The hepatoprotective, *anti-inflammatory*, and antidiabetic actions of purslane are due to its abundance of bioactive substances and plants, which work together to provide these benefits. With promising outcomes, purslane seems to be a natural solution to metabolic diseases and potentially more. However, further research is required to examine the effects of the purslane supplement on extended periods of time, optimal dosage and the mode of action in how purslane works.

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