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سعادة أ. د. رئيس تحرير المجلة المصرية للدراسات المتخصصة المحترم

جامعة عين شمس، كلية التربية النوعية، القاهرة، مصر

تحية طيبة وبعد،،،

يسر **معامل التأثير والاستشهادات المرجعية للمجلات العلمية العربية (ارسيف – ARCIF)**، أحد مبادرات قاعدة بيانات **"معرفة"** للإنتاج والمحتوى العلمي، إعلامكم بأنه قد **أطلق التقرير السنوي التاسع للمجلات للعام 2024**.

ويسرنا تهنئتكم وإعلامكم بأن **المجلة المصرية للدراسات المتخصصة** الصادرة عن **جامعة عين شمس، كلية التربية النوعية، القاهرة، مصر، قد نجحت في تحقيق معايير اعتماد معامل "ارسيف Arcif"** المتوافقة مع المعايير العالمية، والتي يبلغ عددها **(32) معياراً**، وللاطلاع على هذه المعايير يمكنكم الدخول إلى الرابط التالي: http://e-marefa.net/arcif/criteria/

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كما صُنفت مجلتكم في **تخصص العلوم التربوية** من **إجمالي عدد المجلات (127)** على المستوى العربي ضمن الفئة **(Q3)** وهي الفئة الوسطى ، مع العلم أن **متوسط معامل "ارسيف" لهذا التخصص** كان **(0.649)**.

وبإمكانكم الإعلان عن هذه النتيجة سواء على موقعكم الإلكتروني، أو على مواقع التواصل الاجتماعي، وكذلك الإشارة في النسخة الورقية لمجلتكم إلى معامل **"ارسيف Arcif"** الخاص بمجلتكم.

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الجزء الثانى :

أولاً : بحوث علمية محكمة باللغة العربية :

Effect of Golden Germander (Teucrium polium L.) on Male Albino Rats Induced Diabeto-Renal Disease

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Abstract

This study aims to evaluate the nutra-therapeutic effects of dried Germander (0.5% and 1%), as well as aqueous and ethanolic extracts (100 and 200 ppm, for each type of extract) in infected albino rats induced diabeto-renal during 6 weeks. Results showed a significant decrease in glucose levels and serum kidney function parameters (urea, uric acid, and creatinine). These results may be due to bioactive components such as essential oil, polyphenols, flavonoids, carotenoids, vitamin C and vitamin E contents in Germander leaves. In conclusion, the use of Germander may lead to a decrease in glucose levels and potential nephrotoxicity after prolonged administration.

Keywords: Germander, Diabeto-renal disease, Serum glucose, Kidney parameters.

ملخص:

العنوان : تأثير الشندقورة (Teucrium polium L.) على ذكور الفئران البيضاء المصابه بمرض الكلي السكري

المؤلفون : ايمن فتحى خليل ، اسحق مراد الحديدي ، آية عبد الرحمن جاد ، داليا دميان عازر سمعان.

يهدف هذا البحث إلى تقييم الآثار العلاجية الغذائية لنبات الشندقورة المجفف (بنسبة 0.5% و1%)، وكذلك المستخلصات المائية والإيثانولية (100 و200 جزء في المليون لكل نوع من المستخلصات) في الفئران البيضاء المصابة بمرض السكري الكلوي المستحدث خلال 6 أسابيع. أظهرت النتائج انخفاض ملحوظة في مستويات الجلوكوز و وظائف الكلى في المصل مثل (اليوريا، حمض اليوريك، والكرياتينين). قد ترجع هذه النتائج بسبب المكونات النشطة بيولوجياً مثل الزيوت العطري، البوليفينول، الفلافونويد ، الكاروتينات،ومحتوي فيتامين C وفيتامين E في أوراق الشندقورة.

الخلاصة :يمكن أن يؤدي استخدام عشبة الشندقورة المجفف ومستخلصاته إلى انخفاض مستويات الجلوكوز في المصل والسمية الكلوية المحتملة بعد تناوله لفترة طويلة.

الكلمات الدالة : الجيرماندر الشندقورة، مرض السكري الكلوي، جلوكوز المصل، وظائف الكلى.

INTRODUCTION

Genus *Teucrium* belonging to the family Lamiaceae includes about 300 species greatly spread throughout North Africa, Europe and Asian temperate regions, where its different species showed many activities. *Teucrium polium L*. is widely used in traditional medicine to treat hypertension and diabetes or as a wound-healing agent. Germander is a deciduous shrub native to the Western Mediterranean region. It showed many biological activities, such as anti-inflammatory, antiviral, antifungal, antibacterial, cytotoxic, antioxidant, hypoglycemic, hypolipidemic, hepatoprotective, analgesic, and antiulcer effects, in addition to anticonvulsant potential. These activities are highly attributed to plants' bioactive secondary constituents, such as phenylethanoid glycosides, flavonoids, diterpenes, iridoids and essential oil ***(Sharifi-Rad et al., 2022).***

In general, plant extracts are rich in various chemicals of different classes, such as simple phenols, phenolic acids, polyphenolic derivatives, flavonoids, tannins, carotenoids, amino acids, vitamins and many others, which can also be found in animals and microbial products. The diversity of chemical functions contained in plant extracts might constitute a basis for free radical inhibition through various mechanistic pathways. Herein, DPPH and ABTS tests were used since they constitute the first line of tests for investigating biological activities of natural substances. The *in vitro* tests of the free-radical scavenging activities of our plant extracts showed that the concentration inhibited ***(Stobiecka et al. 2022).***

Many species of the genus Germander are used in folk medicine—especially in the treatment of digestive disorders and respiratory problems. Externally, some Germander species can be useful in the treatment of purulent eruptions, furuncles, wounds, mycosis, and skin abscesses (***Frezza et al., 2018).***

A large number of compounds—such as sesqui-, di-, and triterpenoids, iridoids, flavonoids, steroids, carbohydrates,

polyphenols, phytosterols, phenolic acids, amino acids, tannins, vitamin C, saponins, and iridoids glycosides—with a wide spectrum of biological properties, have been isolated from Germander plants. These constituents have been found to have hypoglycemic, hypolipidemic, antispasmodic, anti-inflammatory, analgesic, antipyretic, antifungal, antibacterial, antiviral, cytotoxic, detoxifying, hemostatic, cicatrizing, diuretic, and antiseptic activities, Modern pharmacological studies suggest that some Germander species as are rich natural sources of anticancer compounds, which have proven to be effective against HCT-116 cells (human Colorectal carcinoma cell line initiated from an adult ***(Qabaha et al., 2021).***

This study dims to evaluate the acute and chronic toxicity of Germander leaves and their water and methanolic extracts. It focuses on assessing acute toxicity in both sexes of mice and identifying the target organs affected by chronic exposure.

Materials: -

Dried Germander *(Teucrium polium L.)* herb was obtained from Horticultural Research Institute, Agricultural Research Center, Giza, Egypt.

Chemicals (ethanol, gentamicin, and alloxan), also casein, vitamins, minerals, cellulose and choline chloride were obtained from El-Gomhoryia Company, Cairo, Egypt. Sixty-four male of Albino Rats (*Sprague Dawley Strain*) rats weighing (180 ±10g) were acquired from Experimental Animal House, Food Technology Research Institute, Agricultural Research Centre, Giza, Egypt. Kits to determine serum glucose level, uric acid, urea, creatinine, were purchased from Bio-diagnostic Company in Egypt.

Methods

Chemical analyses of raw materials

The chemical analyses of Germander *(Teucrium polium L.)* leaves such as, moisture, ash, crude oil, crude protein, and crude

fiber was determined according the procedures described in ***AOAC (2012*),** while total carbohydrates were calculated by difference according to ***Mathew et al., (2014).*** Total polyphenolic compounds were determined by the Folin-Ciocalteau method ***(Slinkard and Singleton, 1997)***, the absorbance was measured at 760 nm. Results were expressed as gallic acid equivalents (GAE) per 100 g sample. Also, the content of flavonoid was determined according to ***Chen and Li (2007)*** at a wavelength of 510 nm. Total flavonoids content of herb extracts was calculated using a standard curve prepared as rutin per 100 g sample. Total carotenoids (B-Carotenal) were extracted from Germander according to the methods of ***Schopfer, (1989).*** Then, samples were measured at 664nm and 662nm, 480nm and 510 nm for carotenoids. While, ascorbic acid (vitamin C) was analyzed as described by ***Klein and Perry (1982).*** Also, tocopherol (vitamin E) was determined according to ***Pilar (1999).***

Fractionated Polyphenols and flavonoids were determined using HPLC according to method of ***Goupy et al., (1999)*** and ***Mattila et al., 2000)*** as follow: 5g of Germander *(Teucrium polium L.)* leaves were mixed with methanol and centrifuged at 1000 rpm for 10 min and the supernatant was filtrated through 0.2µm Millipore membrane filter, then 1-3ml was collected in a vail for injection in HPLC Hellwet Puckered (series 1050) equipped with an auto- sampler injector, solvent degasser, ultraviolet (UV) detector set as 289nm and 330nm and a quarter HP pump (series 1050). The column temperature was maintained at 35ºC. Gradient separation was carried out with methanol and acetonitrile as a mobile phase at flow rate 1ml/min.

DPPH scavenging activity tests were carried out according to the method of ***Brand-Williams et al., (1995).*** DPPH radical-scavenging activity = [(Absorbance of DPPH -Absorbance of sample) / Absorbance of DPPH] x 100.

Preparation of extracts

Germander *(Teucrium polium L.)* leaves were washed with

tab water several times to remove any adhering flesh, dried in the oven under vacuum, and then ground well. Ground Germander *(Teucrium polium L.)* powder was dipped in 80% ethanol (1:100 w/v) or in distilled water (1:100 w/v) in a dark bottle for 48h in the refrigerator at 4°C temperature. To obtain extracts, then mixtures were filtered by filter paper (Whatman1). Hydroethanolic extracts were evaporated in rotary evaporator at 40°C ***(El-Hadidy et al., 2018)***

Diet composition and animal groups

Diet composition: the basal diet was prepared according to ***(Reeves et al. 1993).*** The vitamin and mineral mixture were the prepared according *to* ***Campbell, (1963).***

Experimental design: This experiment in the Animal House Unit, Food, Technology Research Institute, Agriculture Research Center. Male albino rats weighing 180 ±10g were adapted for one week prior to the commencement of the experiment, housed in well aerated cages under hygienic conditions and water was ad-libitum. After this week, rats were divided into 8 main groups (eight rats for each) and fed on diets for six weeks as follows: Group 1: Negative control group fed on basal diet. Fifty-six rats will be fed on basal diet and will be treated with gentamicin and aloxane, in paraffin oil (50 % v/v 2 ml/kg) twice a week with a subcutaneous injection to induce chronic damage in the kidney ***(Jayasekhar et al., 1997)***, 7 groups numbered from 2 to group 8 Group2: the positive control group had fed on basal diet till final experiment. Group 3: Treated with 0.5% dried Germander leaves. Group 4: treated as group 3 with 1.0% dried Germander leaves daily. Group 5: treated with 100ppm Germander leaves hydro water extract daily, orally. Group 6: treated with 200 ppm Germander leaves water extract. Group 7: treated with 100ppm Germander leaves hydroethanolic extract daily, orally. Group 8: treated with 200 ppm Germander leaves hydroethanolic extract ***(Chapman et al., 1959)***

Blood Sampling: At the end of the experiment, the rats were fasted overnight then anaesthetized, sacrificed and blood samples were collected from the aorta. The blood samples were centrifuged for 15 minutes at 3000 rpm to separate the serum. The serum was carefully separated into dry clean Wassermann tubes by using a Pasteur pipette and kept frozen till analysis at – 20ºC.

Determination of Uric acid, Urea, and Creatinine:

Uric acid was determined in the serum according to the method described *by* ***Fossati et al., (1980).*** Urea nitrogen was determined according to ***Patton and Crouch, (1977).*** Creatinine was determined according to ***Bartels et al., (1972).***

Statistical analysis

Results were expressed as the mean with standard deviation (SD). Data were statistically analyzed for variance "ANOVA" test at $P \leq (0.05)$ using SPSS statistical software, "version 20" will be used for these calculations ***(Armitage et al.,2002)***

Results and Discussion

Chemical composition of Germander *(Teucrium polium L.)* leaves (g/100g on a dry weight basis).

Germander plant was rich in some phytochemical contents that act as antioxidants, polyphenols, flavonoids, and carotenoids. These components were effective on several diseases as diabetes, hypolipidemia, hepatic and renal diseases. Therefore, this study was designed to determine chemical composition and antioxidants contents that may be due to their effect on diabetic renal.

Table (1) Chemical composition of dried Germander *(Teucrium polium L.)* leave (g/100g): -

Parameters	(g/100g)
Relative Moisture	8.25 ± 0.64
Carbohydrates	59.51 ± 0.53
Proteins	16.58 ± 0.17
Total lipid	6.12 ± 0.02
Crude fiber	12.73 ± 0.56
Ash	9.62 ± 0.32

Vitamin C*	25.53 ± 0.62
Vitamin E**	0.26 ± 0.11
Carotenoids	0.03 ± 0.01
DPPH %	70.26 ± 0.55

*mg/100g ** mg/g

Data are expressed as means ± SD (n=3).

Results in table (1) showed that dried leaves of Germander (*Teucrium polium L.*) had a high content of carbohydrate and protein (59.51and 16.58 g/100g, respectively on dry weight). While, ash contents was 9.62 g/100g on dry weight).

Also, table (1) showcases its impressive nutritional and antioxidant profile. They were rich in vitamin C (25.53 mg/100g), which enhances immune health, and contain vitamin E (0.26 mg/g), essential for skin health and antioxidant benefits. While, carotenoids are present in small amounts (0.03 mg/100g), they contribute to eye health. Additionally, the Germander leaves exhibit potent antioxidant activity, as indicated by the high DPPH value of 70.26%. These attributes make dried Germander leaves a promising candidate for dietary, medicinal, and functional uses.

Essential oil content in Germander leaves.

Several previous studies showed the importance of essential oil in Germander, more specifically, plants from higher altitudes were shown to possess higher sesquiterpene/monoterpene ratios (***Candela et al., 2021*).**

Table (2): Essential oil content in Germander leaves: -

Items	(g/100g on dry weight)
α-Pinene	6.76
β-Pinene	19.82
Myrcene	2.9
p-Cymene	0.55
Limonene	5.71
Camphor	2.45
z-Citral	1.83
Geranial	-
α-Copaene	0.59
Nerol	-
α-Gurjunene	1.13

c-Cadinene	1.04
δ-Cadinene	4.51
α-Cadinol	6.83

The table (2) presented the concentration of various volatile compounds in a sample, expressed as grams per 100 grams of dry weight. Notably, **β-Pinene** has the highest concentration at 19.82 g/100g, followed by **α-Cadinol** at 6.83 g/100g and **α-Pinene** at 6.76 g/100g. **Limonene** and **δ-Cadinene** also exhibit significant presence, with concentrations of 5.71 g/100g and 4.51 g/100g, respectively. Compounds like **Myrcene** (2.9 g/100g), **Camphor** (2.45 g/100g), and **z-Citral** (1.83 g/100g) are moderately represented. On the lower end, **α-Copaene, p-Cymene**, and **α-Gurjunene** are present in smaller amounts, with values ranging from 0.55 to 1.13 g/100g. Meanwhile, **Geranial** and **Nerol** are absent in this analysis. These results highlight the diversity and varying concentrations of terpenes and related compounds in the sample.

These results were adapted by ***Alreshidi et al., (2020)*** detected compounds 29 ones were flavones and flavonols either as aglycones or glycosides in addition to a flavanonol (taxifolin) and a flavanone (naringenin). Moreover, two anthocyanins were recorded (cyanidin-3-O- rutinoside and cyanidin-3-O-glucoside). Aside from that, all the recorded compounds were identified previously in Germander. Based on LC/MS/MS results, Germander extract was further standardized using the available standards; kaempferol, apigenin and gallic acid. Their findings revealed that the plant contents of gallic acid, kaempferol, and apigenin were 0.140 ±0.00105 mg/g, 7.85 ± 0.022 mg/g and 0.102 ± 0.0005 mg/g, respectively

These results highlight the diversity and varying concentrations of terpenes and related compounds in the sample, providing valuable insights into its chemical profile. Such information can be essential for understanding its potential applications in areas like perfumery, pharmaceuticals, food

flavoring, or other industries where these compounds are valued for their aromatic, therapeutic, or functional properties.

Minerals content in dried Germander: -

Germander is rich in minerals necessary for humans, such as calcium, potassium, iron, sodium, magnesium, manganese and zinc. In addition, it showed promising antioxidant, antihyperglycemic, anti-Alzheimer activity and anti-inflammatory activity. Thus, it can be concluded that Germander can act as a suitable candidate for alleviating many health-debilitating problems and could be incorporated into various pharmaceutical preparations. ***(Benchikha et al., 2022).***

Table (3): Minerals content in dried Germander: -

Items	Measure unit
Microelements (ppm)	
Zn	31.27
Cu	12.37
Fe	159.36
Mn	62.14
Macroelements (g/100g)	
N	1.58
P	0.41
K	1.41
Ca	1.24
Mg	0.74
Na	0.31

Germander ***(Teucrium polium L.)*** is a wide strain, which has different species, and we used the extract of D. multicaule montbret in the present study. To get more insight into the chemical characteristics of *Teucrium polium* extract, we aimed to determine the mineral content of the agent. Our results showed that Fe has the highest concentration in comparison with other minerals (Table 3). This concentration was followed by Mn (62.14 mg/kg), Zn (31.27 mg/kg), and Cu (12.37 mg/kg. As summarized in Table 5, the other components of this extract were determined to be K, Ca, Mg, P, and N.

Phenolic compounds of Germander

Germander was shown to contain various phenolic compounds, such as p-coumaric acid, gallic acid, vanillic acid, caffeic acid, ferulic acid, chlorogenic and neochlorogenic acid, rosmarinic acid, tyrosol, verbas coside, alyssonoside, echinacoside, poliumoside, apigenin and its de rivatives, cirsimaritin, luteolin and its derivatives, diosmetin and its derivatives, quercetin, rutin, myrcetin, and catechin ***(Ersoy et al., 2023).***

Table (4): Phenolic compounds of Germander leaves ethanolic extracts by HPLC: -

Phenolic Compounds	(mg/100g)
Gallic acid	121.6
Caffeic acid	198.5
Ferulic acid	203.1
Catechin	188.6
Ellagic acid	891.3
Cinnamic acid	402.4
Salicylic acid	975.3
Chrysin	515.2

mg/100g dry weight basis

Results in Table (4) showed that the content of 8 polyphenolic compounds in germander. Results illustrated that the highest content of phenolic compounds (mg/100g) was salicylic acid (975.3), ellagic (891.3) then cinnamic acid (402.4) and chrysin acid (515.2). While, ferulic acid, catching, caffeic acid and gallic acid (203.1, 188.6, 198.5 and 121.6), repsectively were the lowest content compared to other compounds. Generally, the Germander was rich in salicylic acid, ellagic acid and cinnamic acid.

Flavonoids compounds of Germander:

Because of their antioxidant activity, flavonoids protect against the destructive effects of reactive oxygen species, such as superoxide radicals. Owing to the role of flavonoids in the treatment of cardiovascular diseases, it is necessary to use plants

that have beneficial effects for these diseases. One of such herbs is *Germander* **(*Faizal et al., 2009).***

Table (5): Flavonoids compounds of Germander ethanolic extracts (mg/100g on dry weight basis).

Flavonoid compounds	Conc.(mg/100g)
Gallic acid	24.20
Rutin	92.81
Protocatechuic acid	7.63
Epicatechin	95.50
Rosmarinic acid	88.95
Quercetrin	40.46
Kampferol	189.17
Coumaric acid	5.92
Resveratrol	71.18

In another angle to Germander herbs, it was high in Kampferol, Epicatechin, and Rutin (189.17, 95.50 and 92.81mg/100g, repsectively) followed by, Rosmarinic acid and Resveratrol, 88.96and 71.18mg/100g, respectively. While the lowest content in protocatechuic acid and coumaric was observed 7.63and5.92, repsectively).

Being plant secondary metabolites, the phenolic compounds (simple phenolics, phenolic acids, anthocyanins, hydroxycinnamic acid derivatives and flavonoids) are very important judging from the virtue of their antioxidant capacities by chelating redox-active metal ions, inactivating lipid free radical chains, and avoiding the hydro peroxide conversions into reactive ox radicals. The amounts of total phenolic and flavonoid present in various Germander extracts (methanol, ethanol, ethyl acetate, chloroform, hexane and water) are given. The total phenol content was expressed as mg Gallic Acid Equivalent (GAE) per gram of extract. Total phenol content in different tested extracts ranged between 83.7 ± 0.15 and 206.95 ± 1.82 mg of GAE/g and decreased in the order of methanol > water > ethanol > ethyl acetate > chloroform > hexane. The total flavonoid content in extracts was expressed as mg of Quercetin Equivalent (QE) per gram of extract. The flavonoid content of examined extracts came in a range from 5.74 ± 0.19 to 42.16 ±

0.61 mg of QE/g and decreased in the following order: methanol > water > ethanol> hexane > chloroform > ethyl acetate. This could have been due to the solubility of phenolic compounds in the extracting solvent. Data showed that methanolic extract from Germander aerial parts exhibited the highest amount of total phenols and flavonoids with values of 206.95 ± 1.82 mg of GAE/g and 42.16 ± 0.61 mg of QE/g, respectively. These findings were in good agreement with previous reports, which also found that methanol was the most effective solvent in extracting phenolic components from plants. The recovery of phenols from plant materials is influenced by the solubility of the phenolic compounds in the solvent used for the extraction process. It has been reported that with increase in solvent polarity, total phenol and total flavonoid content increased in extract. Phenolic compounds are often extracted in higher amounts in more polar solvents ***(Ait Chaouche et al., 2018).***

Effect of dried Germander leaves powder and its extracts on serum glucose levels during the experiment period: -

Diabetes mellitus is one of the most global diseases, therefore this study is a trial to present a new hypoglycemic plant source to help hyperglycemic patients.

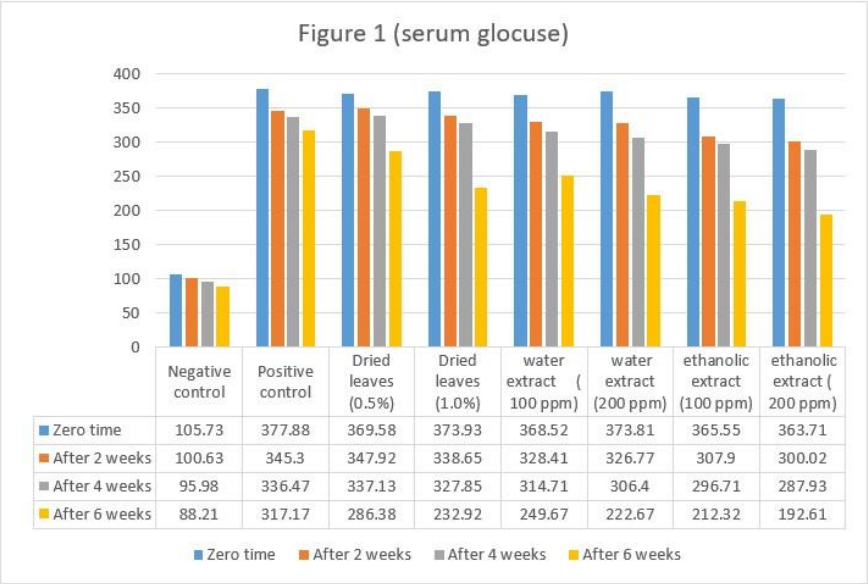
Teucrium species have been used against diabetes in the folklore medicine for centuries. Based on the ethnobotanical research, *T. polium, T. capitatum subsp. capitatum, T. chamaedrys, T. montanum, T. oliverianum,* and *T. stocksianum* were reported to have therapeutic applications in traditional medicine ***(Jaric et al., 2020).***

Table (6): - Effect of dried leaves of Germander and its extracts on glucose level (IU/L) during the experiment at the period.

Time / Group	Zero time	2 weeks	4 weeks	6 weeks	Decreament%
Negative control	105.73e±2.9	100.63g±2.37	95.98g±1.86	88.21g±1.92	22.26
Positive control	377.88d±10.57	345.30f±2.63	336.47f±3.39	317.17f±3.60	16.07
Dried leaves (0.5%)	369.58cd±0.83	347.92e±2.54	337.13e±2.43	286.38e±7.64	22.51
Dried leaves (1.0%)	373.93cd±1.30	338.65d±1.40	327.85d±1.89	232.92de±1.45	37.71
water extract (100 ppm)	368.52bc±0.87	328.40d±1.37	314.71c±3.36	249.67d±4.85	32.25
Water extract (200 ppm)	373.81ab±1.18	326.77c±3.35	306.40b±3.08	222.67c±22.72	40.43
Ethanolic extract (100 ppm)	365.55ab±1.39	307.91b±1.63	296.71a±3.89	212.32b±12.52	41.91
Ethanolic extract (200 ppm)	363.71a±1.66	300.02a±1.78	287.93a±1.72	192.61a±13.86	47.04

All results are expressed as mean ± SD

Values in each row which have different letters are significantly different (p≤0.05).



Serum glucose levels in normal rats fed on basal diet ranged from 88.22±1.92 to 105.73±2.9mg/dL (Table 6). Results in the same table showed a significant decrease in serum glucose after being induced by gentamicin, then alloxan was compared to normal rats.

Results illustrated that gradually decreased in serum glucose after rats were fed on dried Germander (*Teucrium polium)* leaves or its extracts.

Results indicated the highest effect in rats group fed on Germander ethanol extracts 200ppm followed by rats fed on then ethanol extracts (100ppm) after that dried Germander 1.0% then 0.5% at last water extracts 200ppm then 100ppm.

Generally, at the end of experiment, group of rats fed on Germander (*Teucrium polium)* extract 100ppm orally. Also, groups of rats fed on ethanol extracts orally may due to antioxidant contents followed rats fed on diets containing dried extract due to the content of bioactive components as fiber.

The results in table (6) showed that the significant decreament of serum glucose levels in each rats group fed on dried germander and its extracts (water or hydroethanol) compared to positive control group. Serum glucose in rats group fed on Germander hydroethanol extracts (200 and100ppm) orally were 47.04% and 41.91%, respectively. Also, rats fed on Germander hydroethanol extract were better than rats group fed on diets containing dried Germander 1.0% and 0.5% (37.71% and 22.51%, respectively) to decrease the glucose levels. While, rats group fed on water extracts appeared lowest effect serum glucose compared to other groups fed on hydroethanol extracts or dried Germander leaves (Figure1).

Effect of dried Germander leaves powder and its extracts on serum urea (IU/L) during the experiment period

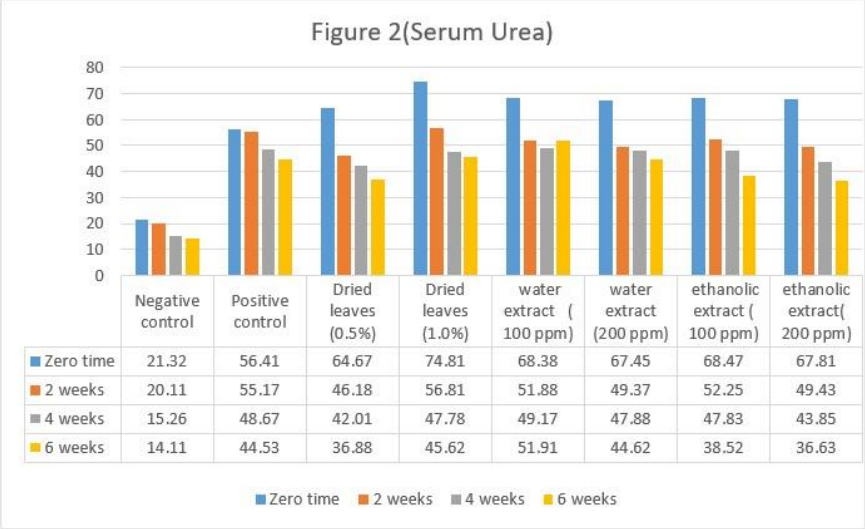
Chronic kidney disease (CKD) is one of the major public health problems. In the United States there are approximately twenty six million adults having non-dialysis dependent kidney disease and over four million adults have chronic renal disease, reaching over thirteen percent of the US population. It is estimated that in the next years, the weight of CKD will increase, and over two million persons are expected to be receiving renal replacement therapy by 2030***(Kobo et al.,2023).***

Table (7): - Effect of dried leaves Germander and its extracts on urea (IU/L) during the experiment at period: -

Time / Group	Zero time	2 weeks	4 weeks	6 weeks	Decreament%
Negative control	21.32e±2.49	20.11e±2.38	15.26c±3.63	14.11d±2.61	33.82
Positive control	56.41d±5.54	55.17d±3.98	48.67b±3.47	44.53c±4.52	21.06
Dried leaves (0.5%)	64.67c±3.19	46.18cd±2.02	42.01b±1.56	36.88c±2.52	42.97
Dried leaves (1.0%)	74.81bc±1.88	56.81cd±5.62	47.78a±1.73	45.62c±2.74	39.01
water extract (100 ppm)	68.38bc±1.90	51.88bc±3.04	49.17a±2.33	51.91b±1.83	24.09
Water extract (200 ppm)	67.45b±1.56	49.37bc±2.29	47.88a±1.63	44.62b±3.62	33.84
Ethanolic extract (100 ppm)	68.47b±1.38	52.25ab±2.79	47.83a±1.94	38.52b±3.04	43.74
Ethanolic extract (200 ppm)	67.81a±1.77	49.43a±2.51	43.85a±1.84	36.63a±3.62	45.98

All results are expressed as mean ± SD.

Values in each row which have different letters are significantly different (p<0.05)



The kidney is one of the important organs in the human body. We need to heathy kidneys to clean the body of contaminants; therefore this study focused on the effect of Germander on parameters of kidney.

Results in table (7) showed the gradually decrement of serum urea during experimental period. Also, serum urea in Germander, the highest decreament result found in group of rats fed on hydroethanol extracts (200 and100ppm) were 45.98%,

43.74% respectively. While, in second rank found in dried Germander leaves 1.0% and 0.5% (42.97% and 39.01%, respectively).

The decrement of serum urea in the lowest decrement effect in serum urea when rats fed on 200 and 100 ppm water extracts, orally (33.84%, 24.09%, respectively) compared to groups fed on dried germander or hydroethanol extracts.

Effect of dried Germander leaves and its extracts on serum uric acid during the experiment at period: -

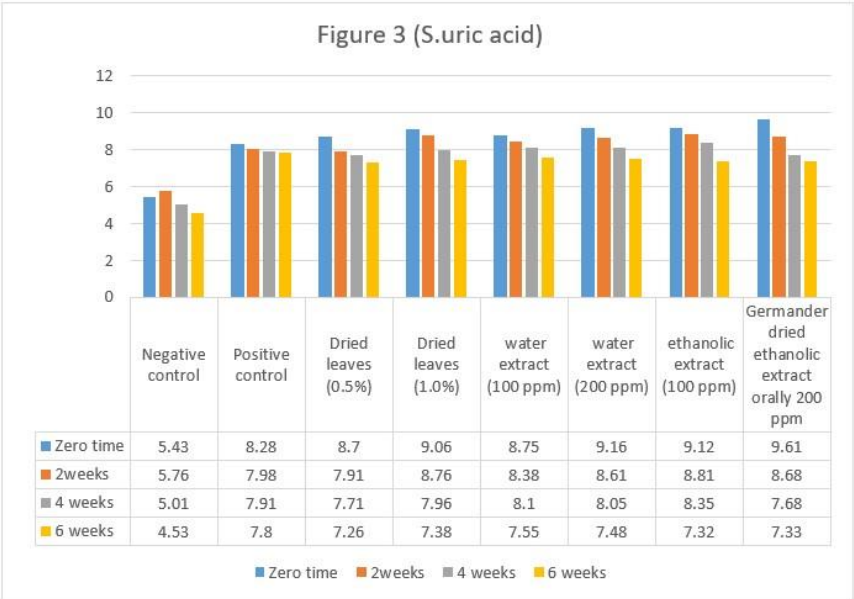
Results in table (8) show the gradual decrement of serum uric acid during the experimental period. Also, serum urea in Germander, the highest decreament result found in group of rats fed on hydroethanol extracts (200 and100ppm) were23.75%, and19.73%, respectively. While, in second rank found in dried Germander leaves (1.0% and 0.5%) 18.54% and 16.55%, respectively.

Table (8): - Effect of dried leaves Germander and its extracts on uric acid (IU/L) during the experiment at period: -

Time / Group	Zero time	2 weeks	4 weeks	6 weeks	Decreament%
Negative control	5.43c±1.42	5.76c±0.64	5.01c±0.49	4.53c±0.47	16.57
Positive control	8.28b±0.41	7.98b±0.93	7.91b±0.37	7.80b±0.36	5.68
Dried leaves (0.5%)	8.70ab±0.49	7.91b±0.31	7.71b±0.26	7.26b±0.22	16.55
Dried leaves (1.0%)	9.06ab±0.33	8.76ab±0.28	7.96ab±0.22	7.38b±0.28	18.54
water extract (100 ppm)	8.75ab±0.70	8.38a±0.69	8.11ab±0.36	7.55b±0.38	13.71
Water extract (200 ppm)	9.16a±0.36	8.61a±0.33	8.05ab±0.19	7.48ab±0.11	18.34
Ethanolic extract (100 ppm)	9.12a±0.28	8.81a±0.29	8.35ab±0.38	7.32ab±0.13	19.73
Ethanolic extract (200 ppm)	9.61a±0.26	8.68a±0.28	7.68a±0.39	7.33a±0.02	23.75

All results are expressed as mean ± SD.

Values in each row which have different letters are significantly different ($p<0.05$)



	Negative control	Positive control	Dried leaves (0.5%)	Dried leaves (1.0%)	water extract (100 ppm)	water extract (200 ppm)	ethanolic extract (100 ppm)	Germander dried ethanolic extract orally 200 ppm
Zero time	5.43	8.28	8.7	9.06	8.75	9.16	9.12	9.61
2weeks	5.76	7.98	7.91	8.76	8.38	8.61	8.81	8.68
4 weeks	5.01	7.91	7.71	7.96	8.1	8.05	8.35	7.68
6 weeks	4.53	7.8	7.26	7.38	7.55	7.48	7.32	7.33

The decrement of serum uric acid in the lowest decrement effect in serum uric acid when rats fed on 200 and 100 ppm water extracts, orally (13.71% and 18.34%, respectively) compared to groups fed on dried germander or hydroethanol extracts.

Effect of dried Germander leaves powder and its extracts on serum creatinine (IU/L) during the experiment period

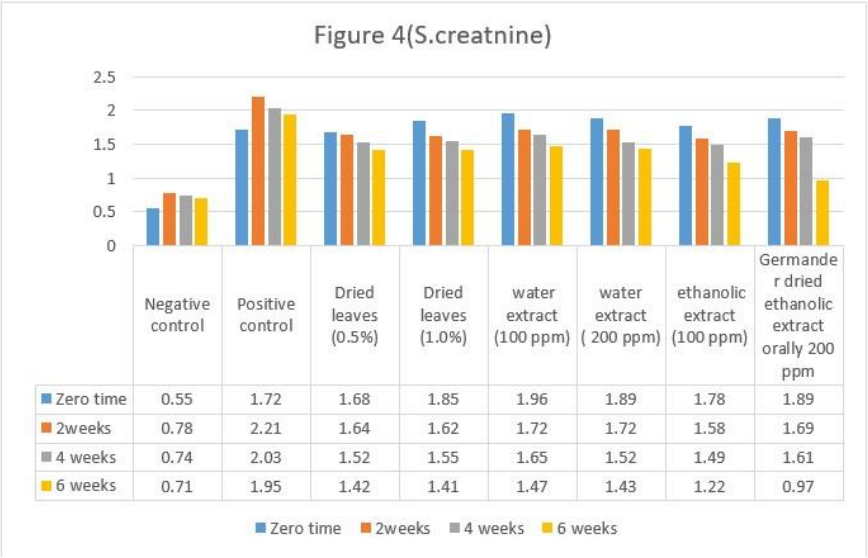
Creatinine is produced in the muscles by the non-enzymatic changes of creatine and phosphocreatinine. The liver has a momentous role in the assembly of creatinine through methylation of guanidine aminoacetic acid. The normal serum creatinine level is 0.5 to 1.0 mg/dL according to diurnal and menstrual variations, pursuit, and diet.

Table (9): - Effect of dried leaves Germander and its extracts on creatinine (IU/L) during the experiment at period

Time / Group	Zero time	2 weeks	4 weeks	6 weeks	Decreament%
Negative control	0.85f±0.04	0.77d±0.04	0.74a±0.03	0.78f±0.04	8.24
Positive control	2.27e±0.18	2.21c±0.25	2.03a±0.15	1.84e±0.04	18.94
Dried leaves (0.5%)	1.68de±0.09	1.64bc±0.09	1.52a±0.04	1.32d±0.02	21.43
Dried leaves (1.0%)	1.85cd±0.05	1.62bc±0.11	1.55a±0.04	1.41c±0.02	23.78
water extract (100 ppm)	1.96bc±0.02	1.72bc±0.06	1.65a±0.04	1.47c±0.02	25
Water extract (200 ppm)	1.92ab±0.04	1.72b±0.07	1.52a±0.04	1.43bc±0.02	25.52
Ethanolic extract (100 ppm)	1.78ab±0.02	1.58b±0.02	1.49a±0.03	1.22b±0.07	31.46
Ethanolic extract (200 ppm)	1.89a±0.03	1.69a±0.02	1.60a±0.02	0.97a±0.08	48.67

All results are expressed as mean ± SD.

Values in each row which have different letters are significantly different (p<0.05)



Results in table (9) showed the gradual decrement of serum uric acid during the experimental period. Also, serum urea in Germander, the highest decremented result found in group of rats fed on hydroethanol extracts (200 and100ppm) were23.75%, 19.73% respectively. While, in second rank found in dried Germander leaves (1.0% and 0.5%) 18.54% and 16.55% respectively.

The decrement of serum uric acid is the lowest decrement effect in serum uric acid when rats are fed on 200 and 100 ppm water extracts, orally (13.71% and 18.34%, respectively) compared to groups fed on dried germander or hydroethanol extracts.

In conclusion, the use of Germander may lead to decrease in serum glucose levels and potential nephrotoxicity after prolonged administration. These results are due to the content of antioxidant contents (polyphenols, flavonoids, carotenoids and essential oil) in Germander.

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