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Efficacy of *Rosmarinus officinalis* L. and $FeCl_3$ Extracts on Some Biochemical Parameters during Treatment of Epilepsy in Male Rats Models

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Abstract

THE RESEARCH methodology included evaluating changes in antioxidants and fat oxide levels. Sixty (60) male mice were divided into six groups: control (no additional treatment), $FECL_3$ group, and four groups managed with different components of *Rosmarinus Officinalis L.* (flavonoid, glycoside, and alkaloids). Show the results, elevated levels of β-secretase, Na, and K in the $FeCl_3$ group and the groups receiving *Rosmarinus officinalis L.* components. Conversely, compared to the $FeCl_3$ group, those administered with *Rosmarinus officinalis L.* components exhibit levels of Fucose, Invins-C, and Zn. In terms of oxidant enzyme activity and the lithe oxidation, the $FeCl_3$ group showed significant increases in GSH, MDA, SOD, and CAT compared to the control group. However, the *Rosmarinus officinalis L.* components resulted in elevated levels of MDA and SOD, along with reduced GSH and CAT levels. In conclusion, the components extracted from *Rosmarinus officinalis L.* β-securecuresed effects on β-Secretase, Fucose, and Voxidantts, in addition to modulating antioxidant activity and lipid peroxidation constituent's sartivevcenreduces the costolesfficinalis L. active constituents The aim of the a novel class of anti-epileptic medications.

Keywords: *Rosmarinus officialis,* β-Secretase, GSH, $FeCl_3$.

Introduction

Epilepsy is a persistent neurological condition characterized by recurrent and unpredictable seizures resulting from abnormal neuronal activity in the brain, stemming from an imbalance between inhibitory and excitatory processes [1]. Epilepsy is characterised by recurrent seizures as well as other symptoms, such as impaired learning and memory. [2]. Damage or death to nerve cells may occur during seizures as a result of the overstimulation of glutamate receptors. [3]. Memory, learning, and synaptic plasticity are all cognitive functions that rely on glutamate. Nevertheless, central nervous system neuronal death may result from

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hyperactivation of glutamate receptors and high glutamate levels. [4]. There are a lot of herbs that have been used traditionally to treat many kinds of illnesses, and scientists have found a lot of plants that have medicinal qualities that may help control epilepsy. [5-7]. According to studies, the asafoetida herb may lessen the intensity, frequency, and length of seizures. [8]. In addition, *Rosmarinus officinalis L.* is closely linked to the promotion of neural stem cell proliferation and the defence of neurons. [9].

Within human populations, herbs such as *Rosmarinus officinalis L.* have played a significant role in promoting health, treating illnesses, and preventing diseases[10]. *Rosmarinus officinalis L.* contains abundant bioactive molecules that exert significant physiological effects on mammalian tissue function, influencing both healthy and diseased states[11].

Previous studies have established a connection between glutamate neurotoxicity and the generation of Reactive Oxygen Species (ROS), which result in cellular damage, particularly affecting organelles such as mitochondria[12].

Consequently, medications capable of neutralizing ROS may safeguard neurons and inhibit their death, as antioxidants extracted from rosemary effectively reduce fat peroxide, which is one of the harmful factors [13]. Another study revealed that rosemary extract, administered at a dose of 100 mg/kg/day with 40 percent carnosic acid orally for 23 days, led to an improvement in memory; this improvement is due to its anti-oxidant effects, and the Rosemary extract reduces the severity and start of seizures in rats[14,15].

Aim of the study: Investigation the potential of *Rosmarinus officinalis L.* candling it sitigating the adverse effects of epilepsy and change of its chemical properties.

Material and Methods

Materials

Sources of medicinal plant classification were used to classify *Rosmarinus Officinalis L.* (Rosemary) were collected from Nineveh at the College of Education / University of Mosul.

Rosemary extraction

Sodium valproate, alkalis, flavonoids, and glycosides extracted from the *Rosmarinus officinalis L.* plant were obtained using the method outlined by [16].

Animals Experimentation

Male albino rats weighing between 185 and 245 grams were provided by the College of Veterinary Medicine / University of Mosul. These rats were housed in standard cages and given ad libitum access to a standard laboratory pellet diet and water. The animal facility maintained a 24 to 29 °C temperature range with a 12-hour light/dark cycle. Ethical approval for the study was obtained from the Institutional Animal Ethics Committee.

Experience design

Use the rats with 60 to explore the potential effects of *Rosmarinus officinalis L.* against liver toxicity caused by $FECL_3$which was mixed in 1: 1 (w/s) with olive oil; rats were classified into 6 groups, each consisting of ten rats, and exposed to treatments next:

Group A (negative control): Rats were fed on a 30 -day natural diet.

Group B (positive control) Rats were fed on a diet that contained olive oil, $FECL_{3,}$ for 30 days, three times a week.

Groups C, D, E, and F Gavage were feed on a diet that contains $FECL_3$ with Sodium valproate, alkalis, flavonoids, and glycosides, respectively, extracted from *Rosmarinus officinalis L.,* from 15 to 30 days by mouth.

Biochemical tests

Use the optical spectrum measurement to measure sodium, potassium, and zinc. The total ascorbic acid content in all samples was evaluated using a modified color test technique that included 2,6-dembipinnol (DCPIP) and 2,4-Dinitrophenylhydrazine (DNPH) [17]. The manufacturer's procedures were followed to evaluate the blood β-secretase concentration using an Enzyme-Linked Immunosorbent Assay (ELISA) kit from Bioassay Technology Laboratory in China. The spectrophotometer detected total fucose levels by directly reacting sulfuric acid with ingredients in the blood serum[18].

Lipid peroxidation and antioxidant enzymes.

The thiobarbituric acid reaction was used to find the malondialdehyde concentrations (MDA). Levels of glutathione (GSH) were determined using this method. [19]. The techniques described were used to evaluate the activity of antioxidant enzymes, such as catalase (CAT) and superoxide dismutase (SOD). [20].

Statistical analysis

A one-way analysis of variance (ANOVA) test was used to analyze the data to find out how different the treatment means.

Results

Table 1 demonstrates the effects of $FeCl_3$ and *Rosmarinus officinalis L.* extraction components on the chemical elements of male rats, and the results demonstrate that the control group had a higher Zn content (µg/dl) (93.14 ± 4) µg/dl than the FeCl3 group (63.55 ± 4.34) µg/dl. After the $FeCl_3$ group had higher sodium levels (132±4, 4.65±0.12) µg/dl and potassium levels (116±4, 4±0.10) µg/dl, the control group had lower levels. When looking at the *Rosmarinus officinalis L.* ingredients, a comparison was made between the control and other groups. The results showed that Group B had a higher ZN concentration than the other groups (80.5±39, 71.15± 3.87, 71.34±4.72, and 80.08±5.29) µg/dl respectively. Although the NA level in the control group was somewhat greater than that of the Galcoside group (114 ± 4) µg/dl, it was lower than the other groups (132 ± 4, 122 ± 4, and 124 ± 4) µg/dl, in that order. In addition, the findings showed that the control group had a lower potassium (K) concentration compared to the $FECL_3$ group treated with sodium and glycoside (4.8 ± 0.11 and 4.1 ± 0.19, respectively) µg/dl. The control group had greater levels than the alkaline group (3.8 ± 0.10) µg/dl and the flavonoid group (3.8 ± 0.29) µg/dl.

The effects of $FECL_3$ and *Rosmarinus officinalis L.* on β-secretase, Fucose, and Vitamin C in male rats are shown in Table 2. According to the findings, the β-essecretase (G/ML) level was lower in the control group (5.92 ± 0.95) compared to the $FECL_3$ group (8.99 ± 1.24). Likewise, Fukuz levels were greater in the control group (10 ± 1.1 1.1) compared to the $FECL_3$ group (6 ± 1.3), and vitamin C levels were higher in the control group (31.94 ± 3.16) than in the $FECL_3$ group. Compared to other groups treated with components from the Rosmarinus officinalis L. extract, the control group had lower levels of β-hooksese (G/ML), according to the data. Further, the values were given in that sequence: 6.84 ± 0.61, 5.98 ± 1.25, and 6.03 ± 1.1.58). The control group had lower levels of Fukuz (MG/DL) (11 ± 1.2) than the $FECL_3$ group, which received sodium, alkalis, flavonoids, and glycoside (5.2 ± 1, 5 ± 1.9, 7 ± 2.1, and 7 ± 1.7), respectively. In the end, the treatment groups that received sodium, alkaline, flavonoids, and glycoside from the FECL3 protocol measured 40.59 ± 4.13, 35.64 ± 4.37, 36.70 ± 4.15, and 36.80 ± 3.18 microliters per litre of vitamin C, respectively, compared to the control group.

Table 3 indicates the effect of $FECL_3$ and *Rosmarinus officinalis L.* on stimulant oxidation enzymes (GSH, MDA, SOD, and CAT) in male rats. In comparison to the $FECL_3$ group, the control group had greater levels of GSH (Mol/Lµ) and Cat (U/L) (16.22 ± 2.46, 1.89 ± 0.04), according to the data. Contrarily, the FECL3 group had significantly higher MDA levels (8.38 ± 1.16 microl/l) and SOD levels (0.332 ± 0.08) than the control group (4.27 ± 0.48 and 0.185 ± 0.04, respectively) in a consecutive order. Sodium album, alkaline, flavonoids, and glycoside were all studied in the FECL3 group; in comparison, the control group had lower GSH levels (Mall/L) than those of the other groups (10.91 ± 1.34, 12.17 ± 1.54, 9.41 ± 1.86, and 11.57 ± 1.11), respectively. The FECL3 group, which received sodium, alkalis, flavonoids, and glycoside as treatments, had lower CAT (U/L) levels (1.99 ± 0.05) than the control group (1.47 ± 0.14), 1.44 ± 0.05, 1.77 ± 0.07, and 1.67 ± 0.14, respectively. Sodium, alkaline, flavonoids, and glycoside-treated FECL3 groups had higher MDA levels (5.75 ± 0.95, 5.56 ± 0.98, 7.07 ± 1.90, and 5.7 ± 1.64 microliters/liter, respectively) than the control group (4.27 ± 0.48). Furthermore, when contrasted with the FECL3 group that received sodium vulvirus, alkaline, flavonoids, and Glycoside treatments, SOD levels were lower in the control group (0.185 ± 0.04).

Discussion

This research explores the preventive characteristics of Rosmarinus Officinalis against damage to spontaneous epilepsy seizures in male mice. The results indicate that the decrease in the levels. This research explored the protective properties of Rosmarinus officinalis against damage induced by FeCl3 and spontaneous epilepsy seizures in male rats. The results indicate that the decrease in the levels of GSH and MDA, at the levels observed in the collections treated with the *Rosmarinus Officinalis L.* extract is in line with the previous research conducted by [21]. This indicates the antioxidant properties of the Rosmarinus Officinalis leaves and their ability to inhibit high levels of MDA.

Medicinal plants are widely used to cure a variety of disorders in several Asian nations, including Iraq, Korea, Japan, and China. [22]. One reason rosemary leaf extract (RO) has strong antioxidant effects is that it contains carnosic acid and carnosol. [23]. According to some research, preventive therapy may reduce Reactive Oxygen Species (ROS) levels and postpone brain deterioration. Nevertheless, there has been little investigation into rosemary extract's (RE) antioxidant efficacy in animal models.

Additionally, research has shown that antioxidant characteristics may be associated with the neuroprotective benefits of Rosmarinus officinalis leaf extract. According to their findings, using it as a dietary supplement may help the body deal with oxidative stress better. On top of that, rosmarinic acid shields biomembranes against oxidative stress. [24]. In addition to maintaining a healthy weight and using antioxidant-rich Rosmarinus officinalis extract supplements, a well-balanced antioxidant level may help delay the disease's development. To our knowledge, this is the first research to show that 6-OHDA-treated rats given Rosmarinus officinalis leaf extract had antioxidant effects [21].

Rosmarinus officinalis is considered one of the abundant medicinal herbs with compounds TRERPENES, Flavonoids, and Polyphenols, which are vegetable chemical compounds, specifically, Diterpenes showed the rosemary of the mountain crown such as Carnosol, Romano and Eberosmanol the ability to inhibit fat peroxide fats[25]. Rosmarinus officinalis extract contains ursolic acid, a compound that possesses antioxidant and anticarcinogenic properties [26]. Aside from its anti-inflammatory and antioxidant properties, rosmarinic acid has hepatoprotective, nephroprotective, and antioxidant benefits [27]. Additionally, One of the main reasons why phenolic phytochemicals have antioxidant activity is their strong scavenging potential, which rosemary extracts are known to possess. [28]. Oxidative stress primarily affects the hippocampus, a brain area that plays a role in learning, memory, mood control, thinking, and the stress reaction. Numerous antioxidant defense systems, both enzymatic and non-enzymatic, exist to protect cells from free radical reactions [29,30]. Because the brain›s natural antioxidant defence mechanisms are inadequate, we postulate that consuming antioxidants via food might positively impact brain functions like memory, neurogenesis, and enzymatic oxidative activities. In research involving rats in the middle years of life, Rasoolijazi and colleagues looked at how rosemary extract affected memory and the antioxidant status of the hippocampus. Improvements in spatial memory and increased activity of antioxidant enzymes like catalase and superoxide dismutase (SOD) were seen after 12 weeks of giving rosemary extract (at dosages of 50, 100, and 200 mg/kg/day, comprising 40% carnosic acid) [31]. Therefore, Among the many natural sources of these chemicals, Rosmarinus officinalis is highly regarded. The powerful antioxidant capabilities of certain components, including phenolic diterpenes, are the reason for its considerable interest. [32].

Conclusion

Rosmarinus officinalis L. had an essential role in reducing the negative effects of FeCl3 in this investigation. Extract from *Rosmarinus officinalis L.* showed promise in reducing lipid peroxidation and increasing the activity of antioxidant enzymes when administered topically. In male rats, the results showed that the antioxidant effects of FeCl3 and the components of Rosmarinus officinalis's extraction affected the levels of β-Secretase, Fucose, and Vitamin C. The *Rosmarinus officinalis L.* plant's active ingredients show great promise as possible options for creating new anti-epileptic drugs.

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TABLE 1. The effect of $FeCl_3$ and *Rosmarinus officinalis L* on some biochemical parameters in male rats.

Parameters	A	B	C	D	E	F
Zn (µg/dl)	93.14± 4	63.55± 4.34	80.5±39	71.15±3.87	71.34±4.72	80.08±5.29
Na (mg/dl)	116± 4	132± 4	132± 4	122± 4	124± 4	114± 4
K (mg/dl)	4±0.10	4.65±0.12	4.8±0.11	3.8±0.10	3.8±0.29	4.1±0.19

TABLE 2. The effect of FeCl$_3$ and *Rosmarinus officinalis L.* extracts on the levels of β-Secretase, Fucose, and Vitamin C in male rats.

Parameters	A	B	C	D	E	F
β-Secretase g/ml	5.92±0.95	8.99±1.24	6.75±1.03	6.84±0.61	5.98±1.25	6.03±1.1.58
Fucose (mg/dl)	10±1.1	6±1.3	5.2±1	5±1.9	7±2.1	7±1.7
Vit-C µmol/l	40.59±4.13	30.34±3	34.23±2.95	35.64±4.37	36.70±4.15	36.80±3.18

TABLE 3. The level of activated oxidant and lipid peroxidation enzyme in male rats exposed to FeCl$_3$ and *Rosmarinus officinalis L.* extracts.

Parameters	A	B	C	D	E	F
GSH mol/lµ	16.22±2.46	7.70±1.14	10.91±1.34	12.17±1.54	9.41±1.86	11.57±1.11
MDA µmol/l	4.27±0.48	8.38±1.16	5.75±0.95	5.56±0.98	7.07±1.90	5.7±1.64
SOD	0.185±0.04	0.332±0.08	0.312±0.07	0.297±0.07	0.266±0.09	0.284±0.07
CAT (U/L)	1.89±0.04	1.34±0.10	1.47±0.14	1.44±0.05	1.77±0.07	1.67±0.14

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تأثير مستخلصات نبات إكليل الجبل (روزمارينيس أفيشيناليز) على بعض المعايير الكيموحيوية أثناء علاج الصرع في نماذج ذكور الجرذان

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الملخص

ينتمي نبات اكليل الجبل (روزمارينيس أفيشينالي) الى عائلة الشفويات (عائلة النعناع)التى تم استخدامها منذ فترة طويلة في العراق نظراً لخصائصه الطبية وأنه مضادة للأكسدة. تهدف هذه الدراسة الى إمكانية استخدام مستخلصات نبات **اكليل** الجبل في التخفيف من الآثار السلبية للصرع وتغيير خصائصه الكيميائية. المواد وطريقة العمل: شملت منهجية البحث تقييم التغيرات في الإنزيمات المضادة للأكسدة ومستويات تحلل التأكسدي للدهون. اذ تم تقسيم خمسين فأر ذكر إلى خمس مجاميع: مجموعة السيطرة (بدون علاج)، ومجموعة $FeCl_3$، وثلاث مجموعات صنفت حسب المكونات التي تم إعطاؤها من مركبات اكليل الجبل وهي (الفلافونويد ، الجليكوسيد، والقلويدات).النتائج: تشير النتائج إلى زيادة في مستويات من β-secretase ، الصوديوم والبوتاسيوم في مجموعة FeCl3 والمجاميع التي تلقت مركبات الاكليل الجبلي. على العكس من ذلك وبالمقارنة مع مجموعة FeCl3, أظهرت النتائج انخفاضا في مستويات الفوكوز, فيتامين C والزنك مع المجموعة التي تم إعطاؤها مركبات اكليل الجبل. اما فيما يتعلق بنشاط الإنزيمات المؤكسدة والتحلل التاكسدي للدهون أظهرت مجموعة FeCl3 زيادة معنوية في مستويات SOD، MDA، GSH، وCAT مقارنة بمجموعة السيطرة. ومع ذلك، أدت مكونات الإكليل الجبلي إلى زيادة في مستويات MDA و SOD، مع انخفاض في مستويات GSH و CAT. الاستنتاج: اظهرت النتائج تأثير المركبات المستخلصة من نبات اكليل الجبل على مستويات β-secretase, الفوكوز و فيتامين C في ذكور الجرذان، بالإضافة إلى تنظيم نشاط مركبات مضادات الاكسدة والتحلل التاكسدي للدهون. كما اشارت النتائج إلى أن المكونات الفعالة لنبات اكليل الجبل يمكن أن تكون بمثابة خيارا جديدا من الأدوية المضادة للصرع.

الكلمات الدالة: إكليل الجبل، β-Secretase, GSH ، كلوريد الحديديك.