



## Efficacy of *Rosmarinus officinalis* L. and FeCl<sub>3</sub> Extracts on Some Biochemical Parameters during Treatment of Epilepsy in Male Rats Models



CrossMark

Ghassan F. Mohammed<sup>1</sup>, Ghaith L.S. Al-Ramadhani<sup>2</sup>, Yaman Q. Sadullah<sup>3</sup>, Farah Y. Hamid<sup>3</sup>, Aws S. Ayoob<sup>3</sup>, Nabaa Kh. Abdullah<sup>4</sup> and Ali M. Saadi<sup>5\*</sup>

<sup>1</sup> Department of Animal Production, Technical Agricultural College, Northern Technical University, Iraq.

<sup>2</sup> General Directorate of education in Nineveh Governorate, Ministry of Education, Mosul, Iraq.

<sup>3</sup> Department of Pharmacy Technology, Mosul Medical Technical Institute, Northern Technical University, Iraq.

<sup>4</sup> Department of community health Techniques, Mosul Medical Technical Institute, Northern Technical University, Iraq.

<sup>5</sup> Department of Anesthesia Techniques, Mosul Medical Technical Institute, Northern Technical University, Iraq.

### 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<sub>3</sub> 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<sub>3</sub> group and the groups receiving *Rosmarinus officinalis* L. components. Conversely, compared to the FeCl<sub>3</sub> 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<sub>3</sub> 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-securecured effects on β-Secretase, Fucose, and Voxidantts, in addition to modulating antioxidant activity and lipid peroxidation constituent's sartivevcentreduces the costolesfficialis L. active constituents The aim of the a novel class of anti-epileptic medications.

**Keywords:** *Rosmarinus officinalis*, β-Secretase, GSH, FeCl<sub>3</sub>.

### 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

\*Corresponding author: Ali M. Saadi, Email: ali.mohammed@ntu.edu.iq. Tel.:009647719623303

(Received 15/03/2024, accepted 24/04/2024)

DOI: 10.21608/EJVS.2024.277075.1920

©2025 National Information and Documentation Center (NIDOC)

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 asafetida 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 carnolic acid orally for 23 days, led to an improvement in memory; this improvement is due to its antioxidant 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  $\beta$ -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 ( $\mu\text{g/dl}$ ) ( $93.14 \pm 4$ )  $\mu\text{g/dl}$  than the  $FeCl_3$  group ( $63.55 \pm 4.34$ )  $\mu\text{g/dl}$ . After the  $FeCl_3$  group had higher sodium levels ( $132 \pm 4$ ,  $4.65 \pm 0.12$ )  $\mu\text{g/dl}$  and potassium levels ( $116 \pm 4$ ,  $4 \pm 0.10$ )  $\mu\text{g/dl}$ , 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 ( $80.5 \pm 3.9$ ,  $71.15 \pm 3.87$ ,  $71.34 \pm 4.72$ , and  $80.08 \pm 5.29$ )  $\mu\text{g/dl}$  respectively. Although the NA level in the control group was somewhat greater than that of the Galcoside group ( $114 \pm 4$ )  $\mu\text{g/dl}$ , it was lower than the other groups ( $132 \pm 4$ ,  $122 \pm 4$ , and  $124 \pm 4$ )  $\mu\text{g/dl}$ , 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 ( $4.8 \pm 0.11$  and  $4.1 \pm 0.19$ , respectively)  $\mu\text{g/dl}$ . The control group had greater levels than the alkaline group ( $3.8 \pm 0.10$ )  $\mu\text{g/dl}$  and the flavonoid group ( $3.8 \pm 0.29$ )  $\mu\text{g/dl}$ .

The effects of  $FeCl_3$  and *Rosmarinus officinalis* L. on  $\beta$ -secretase, Fucose, and Vitamin C in male rats are shown in Table 2. According to the findings, the  $\beta$ -secretase (G/ML) level was lower in the control group ( $5.92 \pm 0.95$ ) compared to the  $FeCl_3$  group ( $8.99 \pm 1.24$ ). Likewise, Fucose levels were greater in the control group ( $10 \pm 1.1$ ) compared to the  $FeCl_3$  group ( $6 \pm 1.3$ ), and vitamin C levels were higher in the control group ( $31.94 \pm 3.16$ ) 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  $\beta$ -secretase (G/ML), according to the data. Further, the values were given in that sequence:  $6.84 \pm 0.61$ ,  $5.98 \pm 1.25$ , and  $6.03 \pm 1.158$ ). The control group had lower levels of Fucose (MG/DL) ( $11 \pm 1.2$ ) than the  $FeCl_3$  group, which received sodium, alkalis, flavonoids, and glycoside ( $5.2 \pm 1$ ,  $5 \pm 1.9$ ,  $7 \pm 2.1$ , and  $7 \pm 1.7$ ), respectively. In the end, the treatment groups that received sodium, alkaline, flavonoids, and glycoside from the  $FeCl_3$  protocol measured  $40.59 \pm 4.13$ ,  $35.64 \pm 4.37$ ,  $36.70 \pm 4.15$ , and  $36.80 \pm 3.18$  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/L) and Cat (U/L) ( $16.22 \pm 2.46$ ,  $1.89 \pm 0.04$ ), according to the data. Contrarily, the  $FeCl_3$  group had significantly higher MDA levels ( $8.38 \pm 1.16$  microl/l) and SOD levels ( $0.332 \pm 0.08$ ) than the control group ( $4.27 \pm 0.48$  and  $0.185 \pm 0.04$ , respectively) in a consecutive order. Sodium album, alkaline, flavonoids, and glycoside were all studied in the  $FeCl_3$  group; in comparison, the control group had lower GSH levels (Mol/L) than those of the other groups ( $10.91 \pm 1.34$ ,  $12.17 \pm 1.54$ ,  $9.41 \pm 1.86$ , and  $11.57 \pm 1.11$ ), respectively. The  $FeCl_3$  group, which received sodium, alkalis, flavonoids, and glycoside as treatments, had lower CAT (U/L) levels ( $1.99 \pm 0.05$ ) than the control group ( $1.47 \pm 0.14$ ),  $1.44 \pm 0.05$ ,  $1.77 \pm 0.07$ , and  $1.67 \pm 0.14$ , respectively. Sodium, alkaline, flavonoids, and glycoside-treated  $FeCl_3$  groups had higher MDA levels ( $5.75 \pm 0.95$ ,  $5.56 \pm 0.98$ ,  $7.07 \pm 1.90$ , and  $5.7 \pm 1.64$  microliters/liter, respectively) than the control group ( $4.27 \pm 0.48$ ). Furthermore, when contrasted with the  $FeCl_3$  group that received sodium, alkaline, flavonoids, and Glycoside treatments, SOD levels were lower in the control group ( $0.185 \pm 0.04$ ).

## 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  $FeCl_3$  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 FeCl<sub>3</sub> 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 FeCl<sub>3</sub> and the components of *Rosmarinus officinalis*'s extraction affected the levels of  $\beta$ -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.

### Acknowledgment

The authors thank the Department of Animal Production, Technical Agricultural College, Northern Technical University.

*Conflict of interest:* None.

*Funding statement:* Self-funding

**TABLE 1.** The effect of FeCl<sub>3</sub> and *Rosmarinus officinalis L* on some biochemical parameters in male rats.

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



**TABLE 2. The effect of  $FeCl_3$  and *Rosmarinus officinalis* L. extracts on the levels of  $\beta$ -Secretase, Fucose, and Vitamin C in male rats.**

Parameters	A	B	C	D	E	F
$\beta$ -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 $\mu$ mol/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/ $\mu$	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 $\mu$ mol/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

### References

- Magiorkinis, E., Sidiropoulou, K. and Diamantis, A. Hallmarks in the history of epilepsy: epilepsy in antiquity. *Epilepsy & Behavior*, **17**(1), 103-108 (2010).
- Kwan, P. and Brodie, M.J. Refractory epilepsy: mechanisms and solutions. *Expert Review of Neurotherapeutics*, **6**(3), 397-406(2006).
- Lewerenz, J. and Maher, P. Chronic glutamate toxicity in neurodegenerative diseases—what is the evidence?. *Frontiers in Neuroscience*, **9**, 170294 (2015).
- Ribeiro, F.M., Vieira, L.B., Pires, R.G., Olmo, R.P. and Ferguson, S.S. Metabotropic glutamate receptors and neurodegenerative diseases. *Pharmacological Research*, **115**, 179-191(2017).
- Kim, H.J., Jee, E.H., Ahn, K.S., Choi, H.S. and Jang, Y.P. Identification of marker compounds in herbal drugs on TLC with DART-MS. *Archives of Pharmacal Research*, **33**, 1355-1359(2010).
- Mohammed, G.F., Sultan, A., Mohammed, G. and Sultan, S.M. Study the histological and biochemical profile effect on the extract *Curubita maschara* on the sugar induced rate. In *AIP Conference Proceedings* (Vol. **2213**, No. 1). AIP Publishing (2020, March).
- Salih, G. M., Jassim, M. A., & Saadi, A. M. Effect cardamom and cinnamon supplemented with soft cheese on tissues rats. *Food Research*, **5**(1), 211-215 (2021).
- Kiasalari, Z., Khalili, M. and Heidari, H. Investigation of anti-convulsant effect of alcoholic Ferula Assa Foetida gum extract PTZ-induced kindling model in mice. *Daneshvar Medicine*, **18**(5), 25-32 (2020).
- Shahraki, A. and Rezazehi, A. R. Neuroprotective effect of aqueous extract of *Achillea millifolium* against retrograde destruction of neurons of ventral horn of the spinal cord after sciatic nerve compression in rats. *Journal of Babol University of Medical Sciences*, **17**(6), 40-47(2015).
- Ashtiyani, S.C., Zohrabi, M., Hassanpoor, A., Hosseini, N., and Hajhashemi, S. Oral administration of the aqueous extract of *Rosmarinus officinalis* in rats before renal reperfusion injury. *Iranian Journal of Kidney Diseases*, **7**(5), 367-375(2013).
- Taheri, S., Zarei, A., Ashtiyani, S.C., Rezaei, A. and Zaheiri, S. Evaluation of the effects of hydroalcoholic extract of *Berberis vulgaris* root on the activity of liver enzymes in male hypercholesterolemic rats. *Avicenna Journal of Phytomedicine*, **2**(3), 153-161 (2012).
- Wang, Q., Yu, S., Simonyi, A., Sun, G.Y. and Sun, A.Y. Kainic acid-mediated excitotoxicity as a model for neurodegeneration. *Molecular Neurobiology*, **31**, 3-16(2005).
- Doolaege, E.H., Vossen, E., Raes, K., De Meulenaer, B., Verhé, R., Paelinck, H. and De Smet, S. Effect of rosemary extract dose on lipid oxidation, colour stability and antioxidant

- concentrations, in reduced nitrite liver pâtés. *Meat Science*, **90**(4), 925-931(2012).
14. Mohammed, G.F., Sultan, S.M. and Sadullah, Y. Q. The relationship between Creatinine and patients with Renal Failure associated with anemia. *Research Journal of Pharmacy and Technology*, **13**(4), 1633-1635 (2020).
  15. Naderali, E., Nikbakht, F., Ofogh, S.N. and Rasoolijazi, H. The role of rosemary extract in degeneration of hippocampal neurons induced by kainic acid in the rat: A behavioral and histochemical approach. *Journal of Integrative Neuroscience*, **17**(1), 31-43(2018).
  16. Abed, A.L. and Saadon, M.B. Isolation of some compounds from celery (*Apium graveolens*) seeds and studying their effects in mice exposed to oxidative stress (Doctoral dissertation, Ph. D. Thesis, College of Education. University, of Mosul, Mosul, Iraq) (2005).
  17. Gazdik, Z., Zitka, O., Petlova, J., Adam, V., Zehnalek, J., Horna, A. and Kizek, R. Determination of vitamin C (ascorbic acid) using high performance liquid chromatography coupled with electrochemical detection. *Sensors*, **8**(11), 7097-7112(2008).
  18. Dische, Z. and Shettles, L.B.A, Specific color reaction of methylpentoses and a spectrophotometric micromethod for their determination. *Journal of Biological Chemistry*, **175**(2), 595-603(1948).
  19. Mohammed, I.H. and Kakey, E.S. Effect of *Prosopis farcta* extracts on some complications (hematology and lipid profiles) associated with alloxan induced diabetic rats. *Iraqi Journal of Veterinary Sciences*, **34**(1), 45-50(2020).
  20. Wheeler, C.R., Salzman, J.A., Elsayed, N.M., Omaye, S.T. and Korte Jr, D.W. Automated assays for superoxide dismutase, catalase, glutathione peroxidase, and glutathione reductase activity. *Analytical Biochemistry*, **184**(2), 193-199(1990).
  21. Rasoul, A., Maryam, H.G., Taghi, G.M. and Taghi, L. Antioxidant activity of oral administration of *Rosmarinus officinalis* leaves extract on rat's hippocampus which exposed to 6-Hydroxydopamine. *Brazilian Archives of Biology and Technology*, **59**. (2016).
  22. Howes, M.J.R. and Houghton, P.J. Plants used in Chinese and Indian traditional medicine for improvement of memory and cognitive function. *Pharmacology Biochemistry and Behavior*, **75**(3), 513-527(2003).
  23. Pérez-Fons, L., Garzón, M.T. and Micol, V. Relationship between the antioxidant capacity and effect of rosemary (*Rosmarinus officinalis* L.) polyphenols on membrane phospholipid order. *Journal of Agricultural and Food Chemistry*, **58**(1), 161-171(2010).
  24. Liu, G.T., Zhang, T.M., Wang, B.E. and Wang, Y.W. Protective action of seven natural phenolic compounds against peroxidative damage to biomembranes. *Biochemical Pharmacology*, **43**(2), 147-152(1992).
  25. Zheng, W. and Wang, S.Y. Antioxidant activity and phenolic compounds in selected herbs. *Journal of Agricultural and Food Chemistry*, **49**(11), 5165-5170 (2001).
  26. Huang, M.T., Ho, C.T., Wang, Z.Y., Ferraro, T., Lou, Y.R., Stauber, K. and Conney, A.H. Inhibition of skin tumorigenesis by rosemary and its constituents carnosol and ursolic acid. *Cancer Research*, **54**(3), 701-708(1994).
  27. Halliwell, B. Antioxidants in human health and disease. *Annual Review of Nutrition*, **16**(1), 33-50 (1996).
  28. Moreno, S., Scheyer, T., Romano, C.S. and Vojnov, A.A. Antioxidant and antimicrobial activities of rosemary extracts linked to their polyphenol composition. *Free Radical Research*, **40**(2), 223-231 (2006).
  29. Balu, D.T. and Lucki, I. Adult hippocampal neurogenesis: regulation, functional implications, and contribution to disease pathology. *Neuroscience and Biobehavioral Reviews*, **33**(3), 232-252(2009).
  30. Almola, A.H., Mahdy Alhamadany, A.Y., Haddad, M.F. and Sultan, S. M. Assessment of genotoxic effect of *Escherichia coli* in patients with urinary tract infection. *Biochemical and Cellular Archives*, **21**, 218 (2021).
  31. Rasoolijazi, H., Mehdizadeh, M., Soleimani, M., Nikbakhte, F., Farsani, M.E. and Ababzadeh, S. The effect of rosemary extract on spatial memory, learning and antioxidant enzymes activities in the hippocampus of middle-aged rats. *Medical Journal of the Islamic Republic of Iran*, **29**, 187(2015).
  32. Wellwood, C.R.L., and Cole, R.A. Applications of spice extracts and other hurdles to improve microbial safety and shelf-life of cooked, high fat meat products *Journal of Agricultural and Food Chemistry*, **52**, 6101-6110(2004).

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

غسان فتحي محمد<sup>1</sup>، غيث لقمان صديق الرمضاني<sup>2</sup>، يمان قيس سعدالله<sup>3</sup>، فرح يونس حامد<sup>3</sup>، اوس صميم ايوب<sup>3</sup>، نبأ خالد عبدالله<sup>4</sup>، علي محمد سعدي<sup>5</sup>

<sup>1</sup> قسم تقنيات الإنتاج الحيواني - الكلية التقنية الزراعية - الجامعة التقنية الشمالية - العراق.

<sup>2</sup> مديرية التربية في محافظة نينوى - وزارة التربية - الموصل - العراق.

<sup>3</sup> قسم تقنيات الصيدلة - المعهد التقني الطبي الموصل - الجامعة التقنية الشمالية - العراق.

<sup>4</sup> قسم تقنيات صحة المجتمع - المعهد التقني الطبي الموصل - الجامعة التقنية الشمالية - العراق.

<sup>5</sup> قسم تقنيات التخدير - المعهد التقني الطبي الموصل - الجامعة التقنية الشمالية - العراق.

### الملخص

ينتمي نبات إكليل الجبل (روزمارينيس أفيشينايز) الى عائلة الشفويات (عائلة النعناع) التي تم استخدامها منذ فترة طويلة في العراق نظراً لخصائصه الطبية وأنه مضاد للأكسدة. تهدف هذه الدراسة الى إمكانية استخدام مستخلصات نبات إكليل 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 إكليل الجبل وهي (الفلافونويد، الجليكوسيد، والقلويدات). النتائج: تشير النتائج إلى زيادة في مستويات من  $\beta$ -secretase، الصوديوم واليوتاسيوم في مجموعة  $FeCl_3$  والمجاميع التي تلقت مركبات الإكليل الجبلي. على العكس من ذلك وبالمقارنة مع مجموعة  $FeCl_3$ ، أظهرت النتائج انخفاضاً في مستويات الفوكوز، فيتامين C والزنك مع المجموعة التي تم إعطاؤها مركبات إكليل الجبل. اما فيما يتعلق بنشاط الإنزيمات المؤكسدة والتحلل التأكسدي للدهون أظهرت مجموعة  $FeCl_3$  زيادة معنوية في مستويات SOD، MDA، GSH، و CAT مقارنة بمجموعة السيطرة. ومع ذلك، أدت مكونات الإكليل الجبلي إلى زيادة في مستويات MDA و SOD، مع انخفاض في مستويات GSH و CAT. الاستنتاج: أظهرت النتائج تأثير المركبات المستخلصة من نبات إكليل الجبل على مستويات  $\beta$ -secretase، الفوكوز و فيتامين C في ذكور الجرذان، بالإضافة إلى تنظيم نشاط مركبات مضادات الأكسدة والتحلل التأكسدي للدهون. كما اشارت النتائج إلى أن المكونات الفعالة لنبات إكليل الجبل يمكن أن تكون بمثابة خياراً جديداً من الأدوية المضادة للصرع.

**الكلمات الدالة:** إكليل الجبل، GSH،  $\beta$ -Secretase، كلوريد الحديدك.