Role of rosemary officinalis in the hepatotoxicity induced by Chlorpyrifos sub-chronic exposure in rats

Reza Pourbabaki, Department Occupational Health Engineering, School of Public Health, Shiraz University of Medical Sciences, Shiraz, Iran.
Monireh Khadem, Department Occupational Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.
Sajjad Samiei, Department Occupational Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.
Fatemeh Amirkhanloo, Department of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran.

Seyed Jamiadedin Shahtaheri, (*Corresponding author), Department Occupational Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. shahtaheri@sina.tums.ac.ir

Abstract

**Background and aims:** Chlorpyrifos is a worldwide used organophosphorus pesticide. In addition to controlling the cholinesterase enzyme, this toxicant also plays a significant role in the oxidative stress and augmented oxidants. Whereas, extracted rosemary is an antioxidant, and plays a protective role against free radicals. Therefore, the object of this study was to investigate the reduction of liver damage caused by chlorpyrifos through the effect of the rosemary extract on the oxidative stress of this pesticide.

**Methods:** In this study, 30 male wistar rats, weighing 200-220 g were used. The animals (Rats) were randomly divided into five groups, each group containing six rats for further comparison; Group I: served as control, Group II: the chlorpyrifos exposure group (13.5 mg / kg single dose), Group III: the group exposed to the rosemary extract (100 mg / kg), Group IV: the exposure group with the toxicant (13.5 mg / kg dose) and rosemary (100 mg / kg concentration), Group V: simultaneous exposure of toxicant and rosemary (200 mg / kg oral dose). After 30 days, the Rats were weighed, killed and the liver tissue was histologically examined and the changes in MDA and GPx were reviewed.

**Results:** The results of statistical tests showed that, compared to the control group, the chlorpyrifos significantly damaged the liver tissue and altered the activity of the glutathione peroxidase and malondialdehyde. The simultaneous exposure to CPF and rosemary extract can significantly make modifications to the GPx and MDA levels and mitigate the CPF damage.

**Conclusion:** According to the results, the rosemary extract can reduce the oxidative stress caused by the chlorpyrifos and this plant can be used to treat poisoning caused by this toxic pesticide.

**Conflicts of interest:** None

**Funding:** None

Keywords

Chlorpyrifos
Oxidative stress
Rosemary
Liver toxicity
Antioxidant

Received: 2020/05/14
Accepted : 2020/12/24
EXTENDED ABSTRACT

Introduction
Chlorpyrifos is a commonly used organophosphorus pesticide, used for household pests and control flies. The chlorpyrifos is toxic to human, and the exposure has been linked to the inhibition of acetylcholinesterase (AChE), leading to the perturbation of the cholinergic synapses and consequent signs of neurotoxicity. The chlorpyrifos induces the chronic toxicity and acute adverse effects including, immunological perturbations, teratogenicity and hepatic dysfunction. This toxicant has a significant role on oxidative stress and augmented oxidants. Many studies confirmed that exposure to Chlorpyrifos, in different animal models, alters tissue contents of the malondialdehyde and glutathione peroxidase. Rosemary is a perennial herb generally used for remedial purposes such as, diabetes, hypercholesterolemia and renal disorders. It also has neuroprotective effects and antioxidantic activities. It has been revealed that, the Rosemary plant contains numerous biologically active substances including, carnosic acid, carnosol or rosmanol; flavonoids such as genkwanin, homoplantaginin or cirsimaritin. However, literature shows that there are no studies contributed to the protective effects of Rosemary leaves against the Chlorpyrifos hepatotoxicity. Therefore, the objective of the present study was conducted to surveying the level of malondialdehyde and glutathione peroxidase activity in the liver tissue, to check the oxidative stress and lipid peroxidation resulting from Chlorpyrifos. This was examined by recording the histopathological alterations and measuring the level changes of malondialdehyde and glutathione peroxidase in the liver tissue.

Methods
In this study, the dried and powdered plant leaves were obtained from the local herbal shop at Tehran, Iran. 50 g of grinded rosemary leaves were suspended in 200 ml of 70% ethanol to obtain the extract. And Commercial grade chlorpyrifos (diethyl 3,5,6-trichloro-2-pyridyl phosphorothioate, formulation EC40.8%) purchased from an agriculturalist were used, after that 30 male Wistar Rats, weighing 200-220 g were selected. Rats were acclimatized in the laboratory conditions for seven days before the initiation of the study. The animals (rats) were randomly divided into five groups, each group containing six rats for further comparison; After the period of acclimation, the rats were randomly assigned into five experimental groups (I-V). In the control group, the distilled water was given by intraperitoneal (i.p). In the groups IV and V, the experimental rats were pre-treated with rosemary once a day for seven consecutive days (100 mg/kg by oral gavage). After the seven days pre-treatment, rats were treated with rosemary in different concentrations, 100 and 200 mg/kg for the groups, IV and V, respectively, and before the administration of Chlorpyrifos only at a dose of 13.5 mg/kg (corresponding to 1/10 LD50 value: 135 mg/Kg). At the end of the experiment, 24 hours after the last exposure, all the rats were weighed and anesthetized; afterwards, the rats were killed. The serum was separated by centrifuging at 4000 rpm for 20 min to be used for the assessment of malondialdehyde and glutathione peroxidase levels. The rats’ liver tissues were dissected out and rinsed in normal saline solution. One part of the liver was homogenized in 4 volumes of phosphate-buffered saline (PBS), centrifuged. The supernatants were stored at -70 0C until they were used for the biochemical studies. Also, a small slice of the liver tissue was fixed in 10% neutral formalin solution for histopathological examination purposes. Lipid peroxidation in the liver was estimated on the basis of their Malondialdehyde content according to the manufacturer protocol (ZellBio, Germany). This assay kit uses the Malondialdehyde with the thiobarbituric acid adduct formed by the reaction of Malondialdehyde and thiobarbituric acid (MDA-TBA) under high temperature. Malondialdehyde was measured in an acidic media and heat (90-1000C) colorimetrically at 535 nm. The values of Malondialdehyde were expressed as µM. The determination of glutathione peroxidase's activity in the liver homogenates, was measured using the ZellBio kits (ZellBio GmbH, Ulm, Germany). This assay kit was used to quantitative assay glutathione peroxidase activity on the basis of the colorimetric assay at 412 nm. For histological examination, the liver tissue was separated and washed with saline and then fixed in 10% formalin. The tissues were then dehydrated and paraffin-embedded in ethanol. The paraffin-embedded samples were spiked with a five µM sample with a microtome (model 4055 Iran) and stained with the hematoxylin-eosin stain. The stained sections were examined by light microscopy and were photographed afterwards. At the level of tissue sections, the pathological indices were scored on a single scale. Data were expressed using the mean and standard deviation. All the statistical analyses were performed using the SPSS 22 Version 22 software. Statistical significances were determined using the one-way ANOVA followed by the Tukey test for the comparison of the control and rosemary-treated group data. The value of P<0.05 was taken as a minimum level of significance.

Results
The present study revealed that the body weights of the rosemary-treated and control groups increased progressively throughout the investigations and recorded a net body weight gain of 23.82 and 26.13%,
Role of rosemery officinalis in the hepatotoxicity...

respectively. However, the net body weight gain of the rats intoxicated with separate administration of the chlorpyrifos was markedly less as compared to the control. Furthermore, co-exposure of the rats to chlorpyrifos and rosemery, increased the body weight gain of the treated rats in group IV and V compared to the control (Fig. 1). The results of the statistical tests showed that, Chlorpyrifos significantly altered the activity of the glutathione peroxidase and Malondialdehyde compared to the control group. The simultaneous exposure to chlorpyrifos and rosemery extract can significantly make modifications to the glutathione peroxidase and malondialdehyde levels as well, and mitigate the Chlorpyrifos damage. After

Fig. 1. The line chart shows the growth patterns of the control, chlorpyrifos-treated, rosemery-treated, co-exposure to CPF and ROS (100 mg/kg), and co-exposure to CPF and ROS (200 mg/kg) animals. The rosemery-treated group and control group have a much higher net body weight gain throughout, compared to the slower weight gain in the chlorpyrifos-treated animals.

Fig. 2. Representative histological images of liver slices (H&E). Normal histoarchitecture representative histological images of the liver slice A: Control rat showing a normal renal architecture. B: CPF-treated rats showing necrosis (red arrow), widening of the sinusoidal spaces (blue arrow) and edema of the central vein (black arrow) C: rats treated with ROS (100 mg/kg) revealed a normal renal architecture D: CPF (13.5 mg/kg) + ROS (100 mg/kg) showed a partial central vein hyperemia (black arrow), inflammation in cells (red arrow) and nucleus cell swelling (green arrow). E: CPF (13.5 mg/kg) + ROS (200 mg/kg) showed normal.
30 days, the sections of the liver from all the groups were processed for histopathological assessment. Fig. 2 depicts a representative histopathology of hematoxylin-eosin–stained of the liver tissues from the experimental groups based on the histopathological results, the liver of the control and rosemary-treated groups, revealed a normal histoarchitecture. On the contrary, liver tissues of the chlorpyrifos-treated rats showed necrosis, widening of the sinusoidal spaces and the edema of the central vein was also observed. Whereas, co-exposure in the group which received the chlorpyrifos and rosemary with a concentration of 100 mg/kg, resulted in a marked improvement in the structure of the hepatocytes as compared to the treated with the pesticide only. In group V, co-administration of rosemary with a concentration of 200 mg/kg and chlorpyrifos, the results were similar to the control group.

**Conclusion**

In toxicological investigations, body weight is an important criterion for the assessment of toxicity. Generally, a considerable decrease or increase in body weight, may be considered as a sign of toxicity. During the course of the current study, in comparison to their initial weights a significant increase in the body weights of control animals was observed at the end of the study. However, the weight gain of the rats intoxicated with chlorpyrifos was much lower compared to the control group. These results are in line with many other studies. This weight loss can be explained by a metabolic imbalance or reduced dietary intake of the rats. Rosemary treatment in the concentration of 100 and 200 mg/kg on the chlorpyrifos-treated rats also resulted in significant net body weight gain. However, this weight gain was somewhat lesser, when compared to the control group. Similar protective effects of the rosemary in improving the body weight gain of the animals, have been reported in other studies as well. According to the results, it was shown that rosemary has a positive effect on the antioxidant systems. In the current study, it was found that the administration of rosemary, dose-dependently reduced the harmful effects of chlorpyrifos toxicity. These effects were observed in the improvement of the liver functions. The positive effects of the rosemary administration on lipid peroxidation is observed at 100 and 200 mg/kg, but at 200 mg/kg dosages, the rosemary seems to have a more prominent effect on reducing the oxidant effect and supporting the antioxidant system. Furthermore, rosemary could alleviate the induced oxidative stress by preserving the activity of glutathione peroxidase. The glutathione peroxidase enzyme levels increased predominantly in the groups in which 100 mg/kg and 200 mg/kg (co-exposure with Chlorpyrifos) of rosemary were administered, however at 200 mg/kg dosages, rosemary seems to have a more prominent effect. Compatible with our present result, it was previously demonstrated that rosemary is a strong scavenger of radicles and reactive oxygen species and therefore, the cellular content of the reduced glutathione peroxidase and antioxidant enzymes are elevated. The co-treatment of rosemary in 100 mg/kg dosage improved histological alterations induced by chlorpyrifos in the liver tissue. In the group of chlorpyrifos and rosemary with a concentration of 200 mg/kg, a normal liver architecture was observed. In conclusion, the data from this study provides further insight, that the chlorpyrifos significantly increased MDA levels, but decreased GPx enzyme activity in liver treated rats at the same time. Protective effects afforded by rosemary in animals treated with the chlorpyrifos. The data suggest that, the rosemary treatment in chlorpyrifos-treated animals afforded protection, according to its antioxidant properties and thus maintaining the structural as well as functional disturbances in the liver. Further studies are needed to determine the exact mechanism of the rosemary extract on the body of the animal and human specimens. One of the strengths of this study is, the use of commercial poison, which is currently being used in the market and agriculture. From this point of view, the results of the study can be generalized to the workplace, but it should be kept in mind that the extract was used purely in the study, and some other measures should be considered for the workplace use.

**How to cite this article:**
The aim of this study was to evaluate the illumination and color temperatures (CCT) of light play an important role in human psychological and physiological well-being. Studies on the visual and mental fatigue have shown that different CCT provided by different lighting are important characteristics of lights are illumination and correlated color temperature (CCT). Color temperatures (CCT) of light play an important role in human psychological and physiological well-being. Studies on the visual and mental fatigue have shown that different CCT provided by different lighting are important characteristics of lights are illumination and correlated color temperature (CCT).

Visual comfort is defined as a person's mental well-being in the workplace. Lighting can provide comfortable working conditions, especially for people with visual disorders in long term. Lighting directly and indirectly affects employees' mental health and their performance. Good lighting is required for good visibility of the workplace and should provide a luminous environment that is human-friendly. Life on Earth cannot be imagined without light. Defects in the environments increase the risk of visual and ergonomic problems, which can also affect one's mental health. For example, one of the factors associated with visual fatigue is the intensity of local illumination at the work surface and at the height of the individual eye level was measured at the user's point of view and the local intensity of illumination at the work surface was calculated using a light meter. A cross-sectional study was conducted in 50 rooms and among 70 employees. The participants were selected through simple random sampling and divided into two groups of intervention and control. The intervention group received training on the importance and benefits of good lighting, while the control group received no training. The intervention group was divided into two subgroups: one received training on lighting and the other received training on plant care. The independent variables in the study were the intensity of the local illumination at the work surface and at the height of the individual eye, while the dependent variables were the intensity of the local illumination at the work surface and at the height of the individual eye. The dependent variables were measured using a light meter. The independent variables were measured using a questionnaire. The data were analyzed using one-way ANOVA and Tukey post-hoc tests. The results showed that the intervention group had a significantly higher intensity of the local illumination at the work surface and at the height of the individual eye compared to the control group. The intervention and training on good lighting can effectively reduce visual fatigue and improve visual comfort. Visual comfort is defined as a person's mental well-being in the workplace. Lighting can provide comfortable working conditions, especially for people with visual disorders in long term. Lighting directly and indirectly affects employees' mental health and their performance. Good lighting is required for good visibility of the workplace and should provide a luminous environment that is human-friendly. Life on Earth cannot be imagined without light. Defects in the environments increase the risk of visual and ergonomic problems, which can also affect one's mental health. For example, one of the factors associated with visual fatigue is the intensity of local illumination at the work surface and at the height of the individual eye level was measured at the user's point of view and the local intensity of illumination at the work surface was calculated using a light meter. A cross-sectional study was conducted in 50 rooms and among 70 employees. The participants were selected through simple random sampling and divided into two groups of intervention and control. The intervention group received training on the importance and benefits of good lighting, while the control group received no training. The intervention group was divided into two subgroups: one received training on lighting and the other received training on plant care. The independent variables in the study were the intensity of the local illumination at the work surface and at the height of the individual eye, while the dependent variables were the intensity of the local illumination at the work surface and at the height of the individual eye. The dependent variables were measured using a light meter. The independent variables were measured using a questionnaire. The data were analyzed using one-way ANOVA and Tukey post-hoc tests. The results showed that the intervention group had a significantly higher intensity of the local illumination at the work surface and at the height of the individual eye compared to the control group. The intervention and training on good lighting can effectively reduce visual fatigue and improve visual comfort. Visual comfort is defined as a person's mental well-being in the workplace. Lighting can provide comfortable working conditions, especially for people with visual disorders in long term. Lighting directly and indirectly affects employees' mental health and their performance. Good lighting is required for good visibility of the workplace and should provide a luminous environment that is human-friendly. Life on Earth cannot be imagined without light. Defects in the environments increase the risk of visual and ergonomic problems, which can also affect one's mental health. For example, one of the factors associated with visual fatigue is the intensity of local illumination at the work surface and at the height of the individual eye level was measured at the user's point of view and the local intensity of illumination at the work surface was calculated using a light meter. A cross-sectional study was conducted in 50 rooms and among 70 employees. The participants were selected through simple random sampling and divided into two groups of intervention and control. The intervention group received training on the importance and benefits of good lighting, while the control group received no training. The intervention group was divided into two subgroups: one received training on lighting and the other received training on plant care. The independent variables in the study were the intensity of the local illumination at the work surface and at the height of the individual eye, while the dependent variables were the intensity of the local illumination at the work surface and at the height of the individual eye. The dependent variables were measured using a light meter. The independent variables were measured using a questionnaire. The data were analyzed using one-way ANOVA and Tukey post-hoc tests. The results showed that the intervention group had a significantly higher intensity of the local illumination at the work surface and at the height of the individual eye compared to the control group. The intervention and training on good lighting can effectively reduce visual fatigue and improve visual comfort. Visual comfort is defined as a person's mental well-being in the workplace. Lighting can provide comfortable working conditions, especially for people with visual disorders in long term. Lighting directly and indirectly affects employees' mental health and their performance. Good lighting is required for good visibility of the workplace and should provide a luminous environment that is human-friendly. Life on Earth cannot be imagined without light. Defects in the environments increase the risk of visual and ergonomic problems, which can also affect one's mental health. For example, one of the factors associated with visual fatigue is the intensity of local illumination at the work surface and at the height of the individual eye level was measured at the user's point of view and the local intensity of illumination at the work surface was calculated using a light meter. A cross-sectional study was conducted in 50 rooms and among 70 employees. The participants were selected through simple random sampling and divided into two groups of intervention and control. The intervention group received training on the importance and benefits of good lighting, while the control group received no training. The intervention group was divided into two subgroups: one received training on lighting and the other received training on plant care. The independent variables in the study were the intensity of the local illumination at the work surface and at the height of the individual eye, while the dependent variables were the intensity of the local illumination at the work surface and at the height of the individual eye. The dependent variables were measured using a light meter. The independent variables were measured using a questionnaire. The data were analyzed using one-way ANOVA and Tukey post-hoc tests. The results showed that the intervention group had a significantly higher intensity of the local illumination at the work surface and at the height of the individual eye compared to the control group. The intervention and training on good lighting can effectively reduce visual fatigue and improve visual comfort.
در میان ترکیبات شیمیایی خطنارک، مواد زیستی عفال از جمله آنتی‌وکسیدان‌ها از أهمیت خاصی برخوردارند. سپس از ترکیبات شیمیایی عفال ترین سپرسنده است که برای اهداف کشاورزی و خانگی به کار رفته می‌شود (17). استفاده گسترده از این سم در حال حاضر به افزایش قابل توجهی در بیشتر مسسیم‌ها می‌باشد. این امر نیازمند پیشگیری از جمله کربونات و آلاینر است. بیماری‌های عصبی از جمله پارکینسون و آلاینر و بیماری‌های قلبی در ارتباط با مواجهه مزمن با ترکیبات از کربونوسیل‌ها، اکسیدان‌ها و آسیدهای قلیمی می‌باشد. 

سپس از ترکیبات شیمیایی عفال استوکسی‌ها، بیماری‌های انگیزه‌ای مانند میزون فعال درد در علت اثرات آنتی‌وکسیدان‌ها، رابطه خاصی با میزان وابستگی بر این سپرسنده است (19). در صورت عفالت انتی‌کربونوسیل‌ها، ساختار کربونوسیل‌ها در بیماری‌های قلبی و عصبی بر این سپرسنده می‌باشد. 

لیموین سی، ت محلول شده از گیاه Lamiaceae، یک ساختمان شیمیایی است که از بیماری‌های انگیزه‌ای با بهبود شدید در علت اثرات انگیزه‌ای مانند میزون فعال درد در علت اثرات آنتی‌وکسیدان‌ها، رابطه خاصی با میزان وابستگی بر این سپرسنده است (19). در صورت عفالت انتی‌کربونوسیل‌ها، ساختار کربونوسیل‌ها در بیماری‌های قلبی و عصبی بر این سپرسنده می‌باشد.

روزمارین، 6 Rosmarinus officinalis

Iran Occupational Health. 2021 (01 March):18: 6
کامیابی گرفتیمی از همکاری عصاره گیاه زمردی را بر منظور کاهش اثرات ناشی از مواجهه با این سم بررسی نماییم.

مواد و روش

آماده‌سازی عصاره گیاه زمردی
در این غلظت دیدگاه مد نظر از محتی برینگی و جهت عصاره گیری از روش خسندن استفاده شد. به‌طوری که باید پس از شستن، خشک و آسیب شدن، پس از 100 میلی‌گرم گیاه کلراید با توجه به منابع، مقدار 50 میلی‌گرم بودر گیاه با 250 سی سی متون خاص مخلوط گردید. نمونه‌ها به مدت 22 ساعت با حالا در تاسیس بوده و در طی این مدت به منظور از دست دادن شکر می‌غذایی استفاده گردید. پس از آن با استفاده مخلوط از کاغذ و مخلوط عصاره به قصد آمده به روان سطح شیشه‌ای گسترده گردید.

مواد شیمیایی

* ethyl *3,5,6-trichloro 2-oro-2-pyridyl phosphorothionate, formulation* از شرکت کشاورزی آرا شیمی (کشور ایران) خریداری شد. کیت‌های سنگین مالون دی آلدنی و zell bio گلیتونیون پراکسیداز از شرکت همچنین مواد شیمیایی و هلاله مورد استفاده در این پژوهش از شرکت مکروالمان (لیم) و با درصد خلوص بالا تهیه گردید.

حیوانات

در این بررسی از سه موس آزمایشگاهی نر بر بالغ از نژاد وسطین (سن بیش از 8 هفته) با محدوده وزنی 200-۲۲۰ گرم استفاده گردید. تمامی حیوانات در شرایط دمایی ۲۳ درجه سانتی‌گراد و دوره روش‌کنایی ۲۴ ساعت در حیوانات خانه دانشگاه تهیه شد. دانشگاه علوم پزشکی تهران گردیدند. در ضمن آب و همکار دانشگاه در اختیار آن‌ها قرار گرفت. کیفیت آزمایش‌های حیوانی براساس دستورالعمل کمیته‌ی اخلاق در پژوهش و صورت IR.TUMS.SPH.REC.1397.061 گرفت.

توجه قواعدی

جهت سازگاری موش با محیط حیوانات به مدت یک هفته در حیوان خانه نگهداری شد و سپس به

1. Phosphate-buffered saline
2. Biotek

Iran Occupational Health. 2021 (01 March);18: 6

[DOI: 10.52547/ioh.18.1.75]
نتایج
گلوتیامین پراکسیداز (GPx) در این مطالعه یکی از شاخص‌های استرس اکسیدانی مورد بررسی آنزیم گلوتیامین پراکسیداز (GPx) بود (شکل 2). مشاهده گردید که بین گروه دریافت کننده گروه نسبت به گروه کنترل مشاهده شد که عصاره دارنده سطح که عصاره میزان گلوتیامین پراکسیداز به گروه کنترل گردید که نشان از افزایش انتی اکسیدانی ی عصاره (شکل 2). همچنین در گروهی که مواجهه هم‌مان با عصاره زامانی و سوم داشتن مشاهده شد که افزایش مقدار ماده آنتی اکسیدانی به پهپاد سطح گلوتیامین پراکسیداز می‌بدد. اما این افزایش معنی‌دار نبود (P<0.05).

بررسی‌های هیستوپاتولوژی
چهت مطالعه باید شناسی، بافت کید ریه شده و با استفاده از سرم فیزیولوژیکی شستشو و سپس در فرمان‌های 10 درصد تثبیت شد. آنها بافت با درجات صعودی آنالوی، اگری و یک داراینگ باله گردن، نمونه‌های قابل‌گیری شده با پارافین تشکیل می‌گردید. مدل 50-55 ایرانی (با ضخامت 5 میکرومتر بر گرید و با رنگ هم‌اکسیلین-اتوتیز رنگ آمیزی شدند. برخی‌ها رنگ‌آمیزی شده توسط میکروسکوپ هیپری مورد بررسی قرار گرفته و آنها عنصر برداده شد. در مقطع‌های بافتی شاخص‌های اسپیشانی با مقياس واحد مورد بررسی قرار گرفت.

تجزیه و تحلیل آماری داده‌ها
در این مطالعه، داده‌ها توسط نرم‌افزار آماری SPSS 22 مورد تجزیه و تحلیل قرار گرفت. از آزمون آنالیز واریانس پوست Hoc و One-way ANOVA و یکطرفه مقایسه‌گره استفاده شد. سطح معنی‌داری کمتر از 0.05 در نظر گرفته شد و نهایتاً نتایج حاصل به صورت میانگین ± انحراف معیار باند.
سمیت کبدی و استرس اکسیداتیو ناشی از سم کلرپیریفوس

نتایج حاصل از مطالعات فایدانشنا در موش‌های صحرایی تیمار با عصاره گیاه رزماری با غلظت 200 mg/kg بقاء کننده سم و کنترل معنی‌دار است و حاکی از این است که افزایش ماده آنتی‌ایکسیدان روند کاهشی در میزان سمیت کبدی داشته است.

شبکه 8: تاثیر ناقص‌شناختی کبد در موش‌های صحرایی CF. A: بافته کبد در موش‌های صحرایی گروه کنترل که چیدمان سلولی طبیعی را نشان می‌دهد. B: شکل‌های مشابه در چیدمان بالی افزایش فعالیت سیتوژنیک، CF. A: کنترل. C: ساختار بافت کبد در موش‌های صحرایی نوروزی با غلظت 200 mg/kg. D: مشابه گروه کنترل می‌باشد.

مقدار 100 × 100 mg/kg CF باعث تغییرات سطح مالون دی آلدئید در گروه‌های مورد مطالعه شد، که بافت کبد در موش‌های صحرایی با استفاده از ماده آنتی‌ایکسیدان مشابه گروه کنترل مشاهده می‌شد. 

**شکل 3:** تغییرات سطح مالون دی آلدئید در گروه‌های مورد مطالعه

**شکل 4:** نانوباران در ناحیه سلول‌های کبد در موش‌های صحرایی CF. A: بافته کبد در موش‌های صحرایی گروه کنترل که چیدمان سلولی طبیعی را نشان می‌دهد.

**شکل 5:** نانوباران در ناحیه سلول‌های کبد در موش‌های صحرایی CF. A: بافته کبد در موش‌های صحرایی گروه کنترل که چیدمان سلولی طبیعی را نشان می‌دهد.
را به عنوان یک مکمل آنتی اکسیدان در کاهش استرس اکسیدانی تابعیت و آسیب بافت کبد نشان داد.

طبق مطالعات که در سال 2009 صورت گرفت، مشخص گردید که کربنیرسوس با دوز 16e میلی‌گرم/کیلوگرم در مدت دو هفته موجب افزایش آسیب‌زاکنده‌های اکسیداسیون در کبد به عنوان حصول MDA (شیمیایی تربوکس (93)). اکسیژن کبدی و واکنش برای اکسیداسیون لیپیدی‌های غشاء سلولی شاخصه شده که نقش مؤثری در بیماری‌های مختلف و همچنین فرآیند التهابی دارد (94). مطالعه حاضر نشان داد که مواریя با خاصیت کاهش استرس اکسیدانی در کبد به عنوان حصول MDA در موش ها صحرایی پس از 30 روز بطور قابل توجه باعث افزایش استرس اکسیداسیون می‌شود که گاه تغییرات آزمایش‌گری با مقایسه با گروه کنترل می‌باشد. افزایش MDA با مطالعات قبله انجام شده در این خصوص مطالعه‌های گردیده است.

در نهایت که در بیماری‌های مختلف اکسیدانی پارسیمونی مطرح شده است که بر گروه اکسیدانی به دلیل نیازمندی با مطالعات هم‌خاکی (95) یا مشابه است. در گروه درمان، گروه سالم مورد بررسی قرار گرفت و در نهایت نتایج حاصل این تحقیق نشان داد که خاصیت گروه اکسیدانی برای درمان بیماری‌های مختلف و تولید حفاظتی در عصاره گیاهی دارای ترکیبات مختلف شامل اکسید آنزیمی، میکروئیدنی و کلرپیلوس (96) می‌باشد. این مطالعه به دلیل اینکه این عصاره به ویژه تونیون‌های غلیظ مصرف اکسیدانی، باعث افزایش CF و بطور به طور مثابه CF در کبد موش صحرایی گردید (شکل 3). این مطالعه از اکسیدانی (GPx) با گلکتازوین-یا مرگ (G2H2) دیو از آن در بایوپروتان ها و چربی با تغییرات آنزیمی است. در مطالعه حاضر CF و CF در گروه GPx تغییرات محیطی در بایوپروتن ها و CF در کنترل مشاهده شد (شکل 1) که نتایج با مطالعات صورت گرفته در این زمینه موثر باشد (97). همچنین مطالعه اکسیدانی در گروه درمان گروه حذف کننده همکاران و CF در کنترل مشاهده گردید که تغییرات CF بایوپروتن ها در این مطالعه ناشی از کاهش CF در گروه درمان می‌باشد.
سمیت کبدی و استرس اکسیداتیو ناشی از سم کلرپیریفوس

**شکل 5** (تغییرات وزنی (گرم) در گروه‌های مورد مطالعه)

مقدار میانی نیست. طبق مطالعه‌هایی که در سال 1397 چهت بررسی اثر آنتی اسیدان‌های گیاه کاکتوسی در برای صورت گرفت مشاهده گردید که با افزایش غلظت گیاه، تغییرات سطح گیاهانی نیست به گروه کنترل ندارد. (77)

در بررسی‌های دیگر، مشاهده گردید که مواجه به سم CPF باعث کاهش یافته در وزن و نیروی زنده می‌باشد. (48) در مطالعه‌های دیگر که به منظور بررسی اثر میزانCPF در روی یافته کم ماهی انجام شده بود، مشاهده گردید که این سم در میان بودن باعث تکرر و ادامه در بافت گروه همزمان با CPF و زمان 2000 mg/kg باعث کاهش وزنی و سطحی در گروه مواجهه در گروه همزمان با CPF و زمان 51 تغییرات لازم است. در مطالعه تغییرات وزنی با حالت تغییرات در صورت گرفتن بافت تغییرات در صورت حرارت گردید که این سم در میان بودن باعث کاهش وزنی و سطحی در گروه همزمان با CPF و زمان می‌باشد. (12)

مواد انتی اسیدان‌های زیادی سرمپریفوس را تعیین می‌نمایند (13، 14). با توجه به مطالعه‌های گیاه رزماری با توجه به دارو های اثر کاهش قرار گرفتن از جمله کارتنی و اصابته در کاهش سامت این سم می‌توان مؤثر متغیر باشد.

با توجه به اینکه مرحله آزمایش بر روی موش‌های صحرایی صورت گرفته و راه‌پذیر این سم کلرپیریفوس از طریق تری نیز بود، مدت زمان مواجهه با سم کلرپیریفوس و تری نیز به پشت بیش از 30 روز دوچرخه‌های بندی محدودیت مالی محفظه مطالعه حاضر نتوانستند سایر شاخص‌های بیوشیمیایی از جمله آنزیم سوپراکسید دیسیموتازی را بررسی کنند.

1 Ziziphora

Iran Occupational Health. 2021 (01 March);18: 6


References


