The Role of Sesame and Rice Bran Oils in Treating of Cold Air-Induced Pneumonia in Experimental Rats

By

Mona S. El Kutry

Home Economics Dept, Faculty of Specific Education, Ain Shams Univ, Cairo Egypt

مجلة البحوث في مجالات التربية النوعية

معرف البحث الرقمي DOI: 10.21608/jedu.2022.121951.1599

المجلد الثامن العدد 43 . نوفمبر 2022

الترقيم الدولي

P-ISSN: 1687-3424 E- ISSN: 2735-3346

موقع المجلة عبر بنك المعرفة المصري https://jedu.journals.ekb.eg/

موقع المجلة http://jrfse.minia.edu.eg/Hom

العنوان: كلية التربية النوعية . جامعة المنيا . جمهورية مصر العربية

دور زيت السمسم وزيت نخالة الارز في علاج التهاب الرئه المحدث بالهواء البارد في فئران التجارب

The Role of Sesame and Rice Bran Oils in Treating of Cold Air-Induced Pneumonia in Experimental Rats

Dr. Mona S. El Kutry

Abstract

Pneumonia means lung inflammation. It is the largest infectious reason for killing adults and children. **Aim**: the main purpose of this work was to investigate the role of sesame oil (SO) and rice bran oil (RBO) against pneumonia induced by exposure to the cold air and histopathology abnormalities in Waster male rats. Methods: G1: received only placebo treatment for 21 days; G 2: was exposed to low- temperature degree 4-5 °C. G3 ingested orally SO 5.0 g/ K.g.bw. G4: exposed to cold plus was given SO 5.0 g/ K.g.bw. G5: ingested orally RBO 5.0 g/ K.g.bw. G6: exposed to cold plus was given RBO 5.0 g/ K.g.bw. G7: exposed to cold plus fed the mixture of SO+ RBO 5.0 g/ K.g.bw (50% of each other). **Results**: the group of rats treated SO & RBO, (G3to G7) have significantly improved ($p \leq 0.05$) in feed intake, BWG %, lung wt., HB, WBC, and glucose, compared with group 2. The results indicated the levels of C- reactive protein (CRP), interleukin-1 alpha (IL-1β) , interleukin-4 alpha (IL-4) and, tumor necrosis factor (TNF-α) ,and IgE , were increased significantly ($p \leq 0.05$) in (G2) compared to all treated groups with SO / RBO or mixtures and histopathology supported these results . **Conclusion:** SO / RBO or mixtures lessen the oxidative process in blood and lung tissue, inflammation markers, cytokine, and IgE levels. So must be included in diet and processing food, especially in infants, children, and elderly persons. It May be recommended in diet the inflammatory diseases, allergy, and diabetes.

Key words: Pneumonia, Sesames oil, Rice brain oil, Inflammation, Cytokines, Rats.

Introduction

Pneumonia means lung inflammation. There are many reasons caused pneumonia can be caused by several infectious agents' bacteria, viruses, or fungi. When a person has pneumonia, the alveoli are loaded with fluid and pus, which makes breathing painful and limits oxygen intake (**Li et al. 2020**). Pneumonia is the largest infectious cause of death in adults and children. Approximately, claiming the lives of 2.5 million, including 672,000 children, in 2019. However, COVID-19 added two million more in 2020, bringing the total to over four million (**WHO,2020**).

The infection of Gram-negative bacteria is the principal cause of acute lung injury (**Huang et al. 20**21). Although, it is generally believed that cold stimulation is related to the susceptibility of respiratory system infection, and cold stimulation (**Joo et al. 2016**). However, especially in seasons with large temperature differences, the probabilities of respiratory diseases are directly and significantly increased, especially for children and the elderly with weak immunity in the cold environment of real life (**Shakoor et al. 202**1). Frequent and intensive changes in temperature and environment can lead to respiratory diseases such as the common cold and pneumonia. In a cold environment, the incidence of pneumonia increased significantly (**Chen et al. 2019&Qian et al. 2021**).

Thite, et al. 2013 said medicinal plants would be the best source to get a variety of drugs. Nowadays, there has been an increasing awareness about medicinal plants. Sesame (*Sesamum indicum L.*) an herbaceous annual belonging to the Pedaliaceae family is a reputed folk medicine in Africa and Asia where all parts of the plant are used (**Gauthaman, 2009**). As, cooking, bakers as a tonic, nutrient, aphrodisiac, diuretic and in the treatment of dry cough, asthma, lung diseases, inflammation, ulcers, urinary diseases, migraine, and vertigo **Hsu& Parthasarathy, (2017**). In Egypt, sesame seeds are popularly used in bakers and making

tahini. Sesame oil (SO) is extracted from seeds, is a supplement that had anti-inflammatory, antioxidant properties, and anti-bacterial significant effects which makes it potential for reducing the risk of cardiovascular disease, as well as atherosclerosis **Hsu& Parthasarathy, (2017**) and **Sadeghi, et al. 2010**. SO has been pharmacological effects including anti-mutagenic, antioxidant, and anti-pyretic preventive effects while antinociceptive properties (**Monteiro,et al. 2014**)

The same **Ogunsola and Fasola in 2014** reported use of the young leaves, sesame seeds are used as a medicine for respiratory diseases and sesame oil was reduced chest complaints. Meanwhile, **Gupta (2009)** identified the compounds present in the sesame such as sesamin, sesamolin, vitamin A, B, C, fixed oils, phenolic compounds, and their pharmacological activities like analgesic, tonic, and anti-colic. Experimental studies on rats fed a sesame seed oily extract exhibited a significant decrease in plasma cholesterol, triglycerides, very-low-density lipoprotein (VLDL) cholesterol، and LDL **(Hong,et al ,2013**). **Ide et al. 2001** recommended that sesame appears to be a potent inducer of hepatic fatty acid oxidation and is an inhibitor of hepatic lipogenic enzyme gene expression. However, **Jadeja (2006)** found the use of seed extracts to treat hemorrhoids and **Tayade and Patil (2006)** mentioned the use of crushed seeds for the treatment of abdominal pain.

Rice bran oil (RBO) is proven from the outer layer of rice (*Oryza sativa*) having a good source of poly-and mono-unsaturated fats is contains %22–%18 oil, vitamins E and K. RBO is in the main produced in Japan, Thailand, India, China, and Vietnam (**Sakina and Gopalakrishna 2004**). The oleic acid, linoleic acid, and palmitic acids are the majority fatty acids in rice bran oil (42%, 32%, and 20%, respectively). RBO contains a range of fatty acids، with 47% monounsaturated, 33% polyunsaturated and %20 saturated. These phytochemicals show numerous biological activities by acting as antioxidant, anti-diabetic، anti-carcinogenic, antiatherogenic, and antihyperlipidaemic agents (**Fraterrigo et al, 2021**).

RBO is a perfect source of tocopherols, which contains about 860 ppm. RBO is a superb source of several micronutrients and natural antioxidants such as γ-oryzanol, sterols, tocopherols, tocotrienols, phospholipids, phytosterols, and squalene. Rice bran oil is lowering serum cholesterol levels, increases fecal bile excretion, inhibits platelet aggregation, and decreasing early atherosclerosis. (**Ghazani and Marangoni,2016**) and (**Riantong and Umar,2019**).

Saikia and Deka, 2011. reported rice bran also includes alpha-lipoic acid, which can support in metabolizing carbohydrates and fats thus called metabolic antioxidants, that lower glycemic index and controls body weight, as well as contains CoQ10 and B vitamin including pangamic acid. Ferulic acid is the major phenolic acid, followed by p-hydroxycinnamic acid, sinapinic, gallic, protocatechuic,p-hydroxybenzoic, and vanillic acid in rice bran (**Goufo and Trinade, 2014**) .

Because of the previous literature, the researcher chose these oils so found in many the market. Also, we found that a few research studied the effect of these oils on pneumonia in rats. So the main purpose of this work was to investigate the role of sesame and rice brain oil against pneumonia induced by exposure to the cold air and histopathology abnormalities in Waster male rats.

2-Material and Methods

2-1Animals

Forty-nine adult male Wistar rats (adults 8–12 weeks) weighing 153–165 g were got from the lab creature offspring unit animal house of the serum and vaccine lab- Giza, Egypt. Animals were sheltered in individual plastic pens. Rats were given unlimited arrival to water and fed a standard pelleted food, as recommended by **Reeves et al. (1993)**. The temperature was maintained at 22 to 24 ± 2 °C with a 12/12 h.

2-2 Induced Pneumonia in rats

The experimental group was exposed to the cold environment (cooling room) of temperature 4 °C, humidity (50 ± 5)% for 8 hours (9 a.m.-5 p.m.) every day, and then transferred to the environment of temperature 22 ± 2 °C, the humidity of (50 ± 5)% to feed, and following for 21 days according to the protocol studied by (**Qian et al. 2021**). The survival rate, appetite, and activity of rats in each group were observed once a day during the feeding process. Most of the rats in group2 had decreased activity and a poor appetite. The mouse in groups 2,4,6, and 7 had poor appetite, and some of them had shivering and dorsiflexion. Rats after the experimental period were anesthetized blood and lung tissue samples were collected.

2-3 The treatment pneumonia protocol

Sesame and Rice bran oil were organic 100% pure cold pressed purchased from local markets in Egypt. The rats were divided into seven groups at random (n = 7). Group one (G1) were received only a placebo treatment (distill water) as the negative control group for 21 days; group 2 was exposed to low temperature degree 4-5 °C, for 8 hours daily. Groups 3 ingested orally sesame oil 5.0 g/ K.g.bw. G4 exposed to cold plus was given an oily extract of sesame oil 5.0 g/ K.g.bw. G5 ingested orally rice bran oil 5.0 g/ K.g.bw. G6: exposed to cold plus was given an oily extract of rice bran oil 5.0 g/ K.g.bw .G7: exposed to cold plus fed the mixture of sesame oil + rice bran oil .5.0 g/ K.g.bw (50% of each other). After the last treatment, all rats fasted for 12 hours but had free access to water. Blood specimens were collected from the orbital sinus veins were transferred to ethylenediaminetetraacetic acid (EDTA) tubes (for whole blood), dry centrifuge tubes (for serum), and lungs were excised. After, separating serum and lung, they were frozen (–20 °C) until analysis. Each sample undergoes only one freeze-thaw cycle before being assayed. Levels of these

cytokines were measured using a multiplexed particle-based flow cytometric cytokine assay (**Vignali,2000**). Prepare the lung to histopathology examination by washing in saline and settling in 10% neutral buffered formalin for 24 hours according to the method of **Bancroft et al., (1996**).

2–4 Nutritional and biochemical analysis

The body weight gain (BWG) = final wt.(g) – starting wt.(g) as well as lung relative weight (%) = lung wt. (g) ÷ final body wt. (g) × 100 were calculated according to **Hsu et al. 1978.** Hemoglobin (Hb) and C - reactive protein (CRP) were estimated according to the **International Committee for Standardization in Hematology (1967)**. Although, according to **Natt and Herrick (1952)** estimated the White blood cell (WBC) and Red blood cell (RBC). Also, determine the lipid peroxide (malondialdehyde) in plasma according to **Yoshioka et al. (1979**), as well as total antioxidant capacity according to the method of **Koracevic et al. (2001**). Glucose was determined in serum using colorimetric methods according to (**Tietz 1986**) and serum triglycerides, high density lipoprotein, and low density lipoprotein according to **Fossati and Principe (1982) and Thomas (1992)**, respectively. Superoxide desmids (SOD) isoform activity was determined spectrophotometrically, as described by **Fukai et al. 1999**. The Glutathione peroxidase (GSH–Px) is measured spectrophotometrically using a direct assay by linking the peroxidase reaction with glutathione reductase with measurement according to **Moin (1986).**

2-5 Measurement of inflammatory cytokines in serum and tissue

The researcher measured cytokines as indicators of inflamed of pneumonia, selected cytokines as interleukin-1 alpha (IL-1β) (Cat. No. BMS630), interleukin-4 alpha (IL-4) and, tumor necrosis factor (TNF-α) were determined by ELISA (Bio-tek Instruments, Inc.) using sandwich enzyme-linked immunosorbent method according to manufacturer's (BioVision) instructions (**Vignali,2000**). Serum IgE levels were measured quantitatively

using commercially available ELISA kits (BETHYL E90-115). Briefly, a 96-well immunoassay plate was coated with capture-antibody (100 μL/well) overnight at room temperature, pursued by a blocking step.

2-6 Statistical analysis

Choosing, Tuky's numerous range as well as one-Way analysis of Variance (ANOVA) to prove the variation between groups at a significance level of $P \leq 0.05$ according to the SPSS, 2015.

Results and Discussion

The nutritional status, blood picture, and glucose of rats with pneumonia

The effect of the sesame & rice bran oil extracts on the nutrition status of rats had pneumonia represented in the table (1). The results showed that rats' exposure to cold air (G2) have low significantly ($p \leq 0.05$) in body weight gain with the mean value (51.3±1.8 g) and low feed intake (5.9±1.9 g) compared to the control negative and treatment groups. The groups (G3 to G7) treated with the SO & RBO extracts increased significantly ($p \leq 0.05$) in B.W.gain. The results observed that the group of rats treated SO & RBO, (G3 to G7) has improved ($p \leq 0.05$) in feed intake, BWG%, and lung wt. compared with group 2. Therefore, we consider that cold stimulation may be the crucial factor leading to host pneumonia. It observes that cold air caused loss of appetites, so changes in atmospheric temperature affect normal conditions in any living things. But also, rats ingested the oils improved the weight however, the gram of oil contain 9 calories.SO is rich in oleic acid (53.8%), linoleic acid (22.1%), and alpha-linolenic acid and glycerides of myristic, palmitic, stearic acids, fixed oils, sesamin, sesamolin, and vitamins A, B, C, (**Gupta 2009**) & (**Chen 2005**) . However, rice bran contains 18%–22% oil, including an array of bioactive phytochemicals such as oryzanol, phytosterol, tocotrienol, squalene, polycosanol, phytic acid, ferulic acid, and inositol hexaphosphate (**Sakina and**

Gopalakrishna 2004; **Ardiansyah et al. 2006; Saikia and Deka 2011**). **Kang and Kim (2016**) showed that dietary RBO may be used functional ingredient to improve the growth performance of birds.

The impact of the SO& RBO extracts on blood pictures and glucose levels of rats who had pneumonia were present in table 2.The results showed that rats exposed to cold air (G2) have low significantly ($p \leq 0.05$) in haemoglobin levels, RBC counts, and platelets concentration with mean value (8.3± 0.7; 3.4±0.5; 402.9±7.0), respectively, compared to all rat groups. The groups treated only with the SO and RBO (G3 & G5) seem normal levels in hemoglobin, RBC, and platelets concentration compared to control negative. The animals treated with SO and RBO plus exposure to cold air (G4, G6, G7) have improved significantly ($p \leq 0.05$) in hemoglobin, RBC, and platelets concentration compared to groups exposed to cold air only and control ve -. Our data in the table (2) represented that the glucose level was the high level significant in G2 exposure to cold air only compared with control-ve and other treated groups. Treatment with SO, RBO, and mixture improved significantly ($p \leq 0.05$) the glucose levels compared to the control ve +. The effect of the SO & RBO on total leukocyte count and differential percentage of rats had pneumonia is shown in table (3) the results showed the WBC, neutrophils, lymphocyte, monocytes, and basophils% were significantly in the high percentage ($p \leq 0.05$) of group 2 exposed to cold air only compared to control ve-. The animals were treated with the SO / RBO or mixtures decreased and improved levels significantly ($p \leq 0.05$) of the WBC, neutrophils, monocytes, and basophils% compared to the control ve+. Except the lymphocyte results did not differ between groups .

Blood parameters are good indicators of the nutritional, physiological, and pathological status of an animal, and changes in hematological parameters have the potential of being used to indicate the impact of nutritional factors. For instance, leukocytes rise sharply when infection occurs, while they are one of the first lines of protection of the body (**Masoudi et al. 2011**).

In earlier studies, **Zhenwei et al. (2012**) and **Erfan Sadeghi et al. (2018**) mentioned that sesame seeds and oil are rich in essential amino acids. It also contains minerals Mg, Ca, P, Fe, Zn, and Co, and vitamin E & K and is rich in fiber, carbohydrate, and protein. Also, are in accordance with that of (**Benkovic et al., 2009**) who reported that sesame seeds mainly stimulate the factors related to RBCs partially than WBCs. **Elleuch et al. (2007**) stated that sesame seed contains flavonoid, which is used as an effective antioxidant and anticancer, and also affects blood lipids and sex hormones. Sesame oil is used as an anti-diabetic medication in lowering blood sugar (**Sankar&Ali, 2011**). **Rehab & Rania (2019**) reported sesame seeds and oil showed that a significant ($p \leq 0.05$) increase in haemoglobin and RBCs were noticed in rats treated compared with positive control. In addition, sesame improves insulin resistance in diabetic mice (**Hong,et al ,2013) .Kang and Kim (2016**) reported the RBO in the diet increased significantly $P < 0.01$) the heterophil, lymphocyte, and monocytes. Also, improve growth performance, total cholesterol in serum, and the immune response of birds.

The oxidative process and antioxidant levels of rats with pneumonia

The antioxidant levels and an oxidative process in the blood and tissue of lungs of rats with pneumonia were reported in the table (4). The results showed that the total antioxidant in blood was decreased significantly ($p \leq 0.05$) of rats expose to cold air only with a mean value (0.07±0.07 mM/ml) compared to control ve - (1.5±0.08 mM/ml). Using SO raised significantly ($p \leq 0.05$) the total antioxidant in blood and lung in groups (3&4) compared to control ve +. Concerning, the total antioxidant in blood levels of rats ingested RBO only or/ and exposed to cold air (G5&G6) were improved significantly ($p \leq 0.05$) compared to control ve +, and the results seem like normal levels. The rats in group7 had normal levels of total antioxidant compared to control ve+. As regard , SOD level in lung and blood were presented in table(4),the results showed the rat expose to cold air only had decreased significantly ($p \leq 0.05$) with mean value (0.6±0.1 u/mg/ protein & 0.8±0.08

u/ml),respectively compared to control ve - (3.2±0.3 u/mg/ protein & 1.5±0. 1 u/ml),respectively . Treatment with SO or RBO or mixtures that (G3 to G7) improved significantly in SOD levels in lung and blood compared to control ve-. The results showed that the decreased levels of the GSH in blood & lung significantly ($p \leq 0.05$) with the rats exposed to cold air (G2) compared to control negative. And vice versa, the animals were treated with the SO /RBO, and mixtures increased and improved levels of the GSH in blood & lung significantly ($p \leq 0.05$) in groups (G3 to G7) compared to control+. In addition, table (4) showed the MDA level in lung and blood increased significantly ($p \leq 0.05$) in group 2 exposed to cold air alone compared to all other groups, and vice versa, treated with SO, RBO or mixtures caused a decrease in MDA levels significantly ($p \leq 0.05$) compared to the control ve +. The previous literature supported our results so, **Sankar,et al,2015** said SO was rich in the lignins and g-oryzanol as antioxidants may also have induced marked and significant reductions in the oxidative process and elevated the antioxidant. **Russo, (2007**) recommended that sesame seeds containing salycilic acid are the contribution of these compounds to the protective effect incidence of cancer. As well, **Jan-on et al., 2020** reported that treating rats with virgin rice brain oil or mitigating all the harmful effects in hypertensive. RBO is rich with γ-oryzanol provides a protective mechanism against oxidative stress and hypertension. Fatty acids capric, caprylic and lauric acid-rich in RBO reduced lipid peroxidation **Sengupta, et al (2014**). In a human study **Aguila, et al 2004** reported that RBO, when consumed as part of a healthy diet for 4 weeks, is effective in improving the risk factors for CVDs by lowering TC, LDL-C.

The fatty profiles, cytokine levels, inflammation factors, and allergy indicators, of rats with pneumonia

The impact of the SO & RBO extracts on fatty profiles concentration of rats had pneumonia was reported in the table (5). The results indicated the triglycerides and low-density lipoprotein (LDL) were increased significantly ($p \leq 0.05$) in group 2 with mean value (138.2±2.4 &58.2±2.9 mg/dl),respectively compared to the

control ve- with mean value (84.3±1.5 &18.7±1.3 mg/dl) ,respectively. And, vice versa, the HDL level was decreased significantly ($p\leq0.05$) of in group 2 with a mean value (15.4±1.2 mg/dl) compared to the control ve- with mean value (34.9±1.9 mg/dl). The treatment with SO/RBO or mixtures decreased and improved significantly ($p\leq0.05$) in triglycerides and LDL compared with control ve+. Concerning, the HDL levels have seen the treatment with SO & RBO or mixtures increased and improved significantly ($p\leq0.05$) in groups (G3 to G7) compared to control ve +. On other hand, the rats ingested the SO & RBO only seem normal levels in triglycerides and HDL compared with control ve-.

The impact of the SO & RBO extracts on the inflammation and cytokine levels of rats with pneumonia were shown in table (6). In this regard, we have investigated the serum levels of the CRP, IL-1 alpha, IL-6, and TNF-α in rats. The results showed the levels of CRP, IL-1 alpha, IL-6, and, and TNF-α were increased significantly ($p\leq0.05$) in (G2) rats exposed to cold air only compared to all treated groups with SO/ RBO or mixtures that (G3 to G7) and control negative .Conversely, animals in groups (3to7) ingested SO / RBO or mixtures reduced and improved significantly ($p\leq0.05$) in CRP, IL-1 alpha, IL-6, and, and TNF-α levels compared to rats had exposed to cold air only. Our finding that groups of rats fed the SO / RBO alone have normal levels of CRP, IL-1 alpha in blood and lung, and IL-6 in blood compared to control negatively. The results of IgE levels indicated that group (2) had a high level of IgE ($p\leq0.05$) with a mean (893.3± 5.8 ng/ml) compared to group (1) with a mean (168.7± 1.8 ng/ml). The groups treated with SO / RBO or mixtures decreased levels of the IgE significantly ($p\leq0.05$) compared to control ve+. However, rats ingested SO / RBO (G 3&G5) had normal levels of IgE compared to control ve-. These results agreed with antioxidants and oxidative results were shown in table 4 and, acceptable with histopathology of lung results. There have been several reports that emphasize and support our results regarding the antioxidant effects of SO & RBO.

Evidence from animal studies says that the sesame improves hyperglycemia reduces inflammation and improves insulin resistance in diabetic mice (**Hong, et al, 2013**). SO increases in gamma-tocopherol levels in tissues that could lead to inhibition of different free radicals). **Rafiee,et al. 2021** indicated sesame consumption reduced serum levels of IL-6 but did not affect CRP and TNF-α in humans. These results did not accept of our results so human studies have many cross factor effects on diet in humans. **Khadem et al. 2014** showed that sesame seed a significant decrease in serum IL-6 and CRP values in patients with knee osteoarthritis. Consistent with our study, **Chen et al. (2005)** reported that the secretion of IL-6 from BV-2 cells was blocked after 4 hours of treatment with different concentrations of sesamin. **Sankar, et al. 2015** and **Khadem , et al. 2014** showed SO was rich in lignans and ability to increase vitamin E level in various tissues, and g-oryzanol were played antioxidants ,and anti-inflammatory. Many results illustrated RBO has numerous biologically active compounds like antioxidant, anti-diabetic, anti-carcinogenic, antiatherogenic, and antihyperlipidaemic agents (**Fraterrigo et al., 2021**), and contains g-oryzanol, tocopherols, and tocotrienols have been shown to inhibit oxidation (**Zavoshy et al. 2012**) & (**Sengupta, et al.2014**).

The results of histopathological examination of lungs

Macroscopically examination of lungs of control ve- revealed the normal histological structure (normal bronchioles and normal alveoli) (Photo 1). On contrary, the lungs of control positive rats showed thickening of interstitial septa with inflammatory cells (interstitial pneumonia (Photos 2and 3). Meanwhile, lunges of rats from group 3 demonstrated no histopathological alterations (Photo 4). Moreover, most examined sections from group 4 exhibited no histopathological changes (Photo 5). Meanwhile, the lungs of rats from group 5 exhibited no histopathological alterations. However,

the lungs of rats from group 6 revealed focal interstitial pneumonia, although examined other sections showed no histopathological changes (Photos 5 and 6). On the other hand, examined sections from group 7 showed no histopathological alterations (Photo 7).

In conclusion

Inference, oily extracts of sesame & rice bran or their mixture could be reduced the side effect of the flu situation and pneumonia in rats. It's maybe improved the nutritional status, anemia, support immunity system. They lessen the oxidative process in blood and lung tissue, inflammation markers, cytokine levels, and IGE levels. So must be included in diet and processing food, especially in infants, children, and elderly persons. It may be recommended in diet the inflammatory diseases, allergy, and diabetes.

Table (1) The effect of the sesame oil & rice bran oil on nutrition statues of rats who had pneumonia

Groups	Feed intake (g)	Lung ratio wt. %	BWG %
G1(-)	10.3±1.8 ^{d}	0.8±0.1 ^{a}	69.4±3.0 ^{c}
G2 (+)	5.9±1.9 ^{f}	0.5±0.03 ^{n}	51.3±1.8 ^{f}
G3 SO	12.0±2.2 ^{d}	0.8±0.1 ^{a}	97.0±0.0 a
G4 SO+ cold	8.3±2.5 ^{dc}	0.4±0.05 ^{n}	86.3±1.8 ^{ac}
G5 RBO	11.4±1.2 ^{d}	0.7±0.1 ^{ao}	91.3±9.0 ^{a}
G6 RBO+ cold	8.4±0.8 ^{dc}	0.7±0.1 ^{ao}	84.1±3.8 ^{ac}
G7 Mixture SO+ RBO+ cold	11.4±1.6 ^{d}	1.0±0.2 ^{ae}	88.3±2.7 ^{a}

* Each value represents the mean ± SD. Means in the same column with different superscript letters are significantly different at p≤0.05.

Table (2) Impact of the sesame & rice bran oil on blood pictures and glucose levels of rats that had pneumonia

Groups	Hemoglobin (gm/dl)	RBC (mil/µl)	Platelets 10^3/cmm	Glucose (mg/dL)
G1(-)	16.2±0.80^{a}	4.8±0.3 ^{e}	603.0 ±6.9 ^{b}	86.0± 3.5 ^{d}
G2 (+)	8.3± 0.71^{b}	3.4±0.5 ^{b}	402.9±7.0 ^{c}	190.7±5.3 ^{e}
G3 SO	15.7±0.45 ^{a}	4.6±0.4 ^{e}	600.1±3.0 ^{bb}	82.6±1.7 ^{df}
G4 SO+ cold	12.2±0.60 ^{c}	4.5±0.4 ^{e}	412.1± 8.4 ^{ce}	154.0±4.1 ^{dc}
G5 RBO	14.3±0.80 ^{a}	4.7±0.5 ^{e}	576.4 ± 7.9 ^{bb}	118.6±7.4 ^{dl}
G6 RBO+ cold	10.1±0.18 ^{b}	4.4±0.5 ^{e}	510.7 ±1.7 ^{bo}	134.9±4.5 ^{di}
G7 Mixture SO+ RBO+ cold	16.40±0.7^{a}	4.4±0.2 ^{e}	605.9 ±5.1 ^{b}	90.6±2.4 ^{d}

* Each value represents the mean ± SD. Means in the same column with different superscript letters are significantly different at p≤0.05.

Table (3) The effect of the sesame oil & rice bran oil on total leukocyte count and differential percentage of rats had pneumonia

Groups	WBC (10^3/ul)	Neutrophils %	Lymphocyte %	Monocytes %	Basophils %
G1(-)	14.8±0.2^{a}	3.6 ±0.5 ^{k}	79.6±1.6 ^{d}	2.9±0.4 ^{i}	0.0±0.0 ^{L}
G2 (+)	23.7±1.5^{b}	13.7±1.3 ^{l}	85.7 ±6.2 ^{f}	8.9±0.7 ^{h}	2.0±0.0 ^{G}
G3 SO	13.1±0.7^{a}	2.0±0.0 ^{o}	80.9±1.1 ^{d}	3.6±0.5 ^{i}	0.0±0.0 ^{L}
G4 SO+ cold	18.5±0.9^{c}	4.3±0.8 ^{k}	80.0±1.4 ^{d}	3.3±0.8 ^{ie}	0.40±0.5^{L}
G5 RBO	17.5±0.5^{ce}	3.4±0.5 ^{k}	81.0±3.0 ^{df}	2.9±0.4 ^{i}	0.0±0.0 ^{L}
G6 RBO+ cold	19.3±2.9^{a}	1.6±0.5 ^{o}	81.0±0. 8 ^{df}	2.3±0.5 ^{if}	0.50.0±0.2 ^{L}
G7 Mixture SO+ RBO+ cold	16.4±1.6^{ac}	1.4±0.5 ^{o}	79.7±1.8 ^{d}	2.4±0.5 ^{ie}	0.0±0.0 ^{L}

* Each value represents the mean ± SD. Means in the same column with different superscript letters are significantly different at p≤0.05.

Table (4) Effect the sesame oil & rice bran on the antioxidant levels and an oxidative process in the blood and tissue of lungs of rats with pneumonia

Groups	Total anti-oxidant in Blood (mM/ml)	SOD in Lung (u/mg/ protein)	SOD in Blood (u/ml)	GSH (mu/mg/protein) in Lung	GSH (mu/ml) in blood	MDA in Lung(n. mol/mg/ protein)	MDA in Blood (n. mol/ml)
G1(-)	1.5±0.08 a	3.2±0.3 e	1.5±0.1 a	7.1±0.4 f	2.7 ±0.2 e	0.7±0.1 b	0.3±0.03 f
G2 (+)	0.07±0.07 c	0.6±0.1 h	0.8±0.08 c	1.8±0.4 d	0.8±0.1 c	7.1±0.1 d	4.3±0.3 d
G3 SO	1.5±0.22 a	3.1±0.1 e	1.0±0.08 c	6.8±0.2 f	2.8±0.3 e	0.7±0.08 b	0.3±0.01 f
G4 SO+ cold	0.7±0.1 ab	1.1±0.1 f	0.9±0.1 c	4.0±0.4 fe	1.5±0.2 f	4.6±0.3 c	2.6±0.1 fb
G5 RBO	1.3±0.2 a	2.9±0.1 e	1.2±0.2 ab	3.1±0.1 fo	2.3±0.3 ed	0.7±0.06 b	0.8±0.2 fc
G6 RBO+ cold	1.3±0.2 a	3.2±0.3 e	1.8±0.2 ab	4.4±0.7 fo	2.0± 0.3ea	2.0±0.3 cb	1.3±0.3 fa
G7 Mixture SO+ RB O+ cold	1.2±0.3 ae	2.2±1.0 o	0.9±0.1 c	7.1±0.2 f	1.9±0.2 a eh	1.6±0.3 be	0.7 ±0.2 ff

* Each value represents the mean ± SD. Means in the same column with different superscript letters are significantly different at p≤0.05.

Table (5) impact of the sesame oil & rice bran oil on fatty profiles concentration of rats had pneumonia

Groups	Triglycerides (mg/dl)	HDL (mg/dl)	LDL (mg/dl)
G1(-)	84.3±1.5 ^{c}	34.9±1.9 ^{g}	18.7±1.3 ^{a}
G2 (+)	138.2±2.4 ^{e}	15.4±1.2 ^{i}	58.2±2.9 ^{b}
G3 SO	84.8±1.4 ^{c}	35.6±2.0 ^{g}	18.5±0.9 ^{a}
G4 SO+ cold	99.1±9.9 ^{cf}	25.2±1.1 ^{ge}	24.3±2.4 ^{c}
G5 RBO	86.6±3.0 ^{c}	28.5±2.4 ^{gf}	20.8±1.8 ^{e}
G6 RBO+ cold	99.1±1.7 ^{cf}	28.8±2.2 ^{go}	20.9±2.1 ^{ac}
G7 Mixture SO+ RBO+ cold	85.2±2.9 ^{c}	35.0±2.9 ^{gg}	16.3±0.9 ^{ad}

* Each value represents the mean ± SD. Means in the same column with different superscript letters are significantly different at p≤0.05.

Table (6) Impact of the sesame oil & rice bran oil on the inflammation and cytokine levels of rats with pneumonia

Groups	CRP(ng/ml)	L1B IL-1 pg/mg in blood	L1B IL-1 pg/mg in Lung	1L4 (pg/ml) in blood	TNF -a (pg/ml) in blood	IgE (ng/ml) in blood
G1(-)	33.02 ±1.8 ^{n}	82.8±5.2 ^{e}	156.8±2.5 ^{j}	2.9± 1.2 ^{ee}	60.8± 2.6 ^{c}	168.7± 1.8 ^{aa}
G2 (+)	154.2±5.6 ^{p}	192.9±6.0 ^{a}	261.84 ±7.2 ^{o}	90.0±2.2 ^{hh}	156.8±4.2 ^{f}	893.3± 5.8 ^{dd}
G3 SO	36.8±4.4 ^{n}	81.1±3.9 ^{e}	159.3±6.2 ^{j}	3.2 ±1.1 ^{ee}	72.3±3.2 ^{a}	183.0 ±2.2 ^{ab}
G4 SO+ cold	67.9±6.2 ^{nm}	102.7±6.1 ^{ei}	169.7±10.0 ^{j}	34.4 ±2.5 ^{ll}	92.0±2.2 ^{ac}	303.0 ±2.2 ^{cc}
G5 RBO	39.1±3.1 ^{n}	91.2±3.8 ^{eh}	160.0±3.7 ^{jn}	7.0 ±2.2 ^{ef}	68.4±1.9 ^{a}	172.3±5.4 ^{ae}
G6 RBO+ cold	87.8±7.9 ^{nm}	91.2±4.6 ^{e}	169.2±10.7 ^{je}	43.6 ±2.1 ^{mm}	88.4±1.9 ^{ac}	256.0 ±4.3 ^{ff}
G7 Mixture SO+ RBO+ cold	49.3±3.9 ^{no}	84.0±2.6 ^{eh}	158.3±4.6 ^{jj}	24.6 ±1.5 ^{pp}	70.4±1.0 ^{a}	203.0 ±2.2 ^{ll}

* Each value represents the mean ± SD. Means in the same column with different superscript letters are significantly different at p≤0.05.

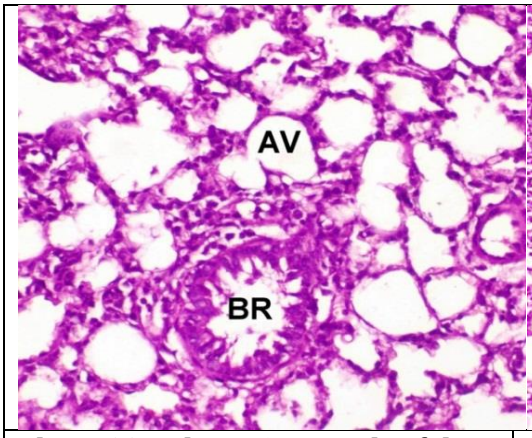

Photo (1): Photomicrograph of lung of control ve- showing the normal histological structure (normal bronchiole (BR) and normal alveoli (AV) (H & E, x 200).

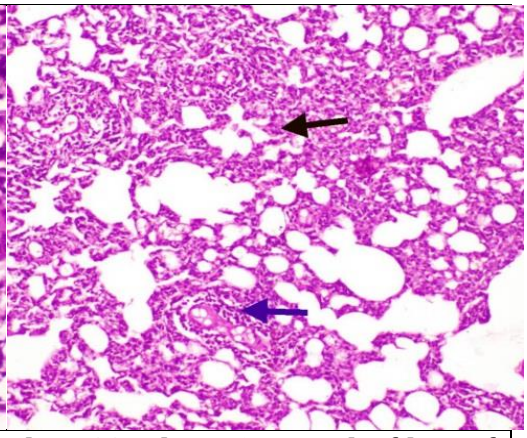

Photo (2): Photomicrograph of lung of group 2 of rats showing thickening of interstitial septa with inflammatory cells (interstitial pneumonia (black arrow) and perivasculitis (blue arrow) (H & E, x 100).

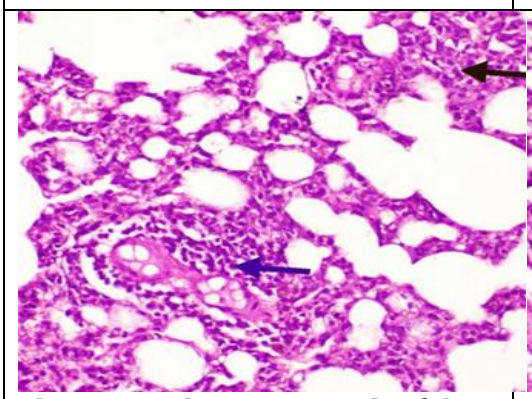

Photo (3): Photomicrograph of lung of group 2 of rats showing thickening of interstitial septa with inflammatory cells (interstitial pneumonia (black arrow) and perivasculitis (blue arrow) (H & E, x 200).

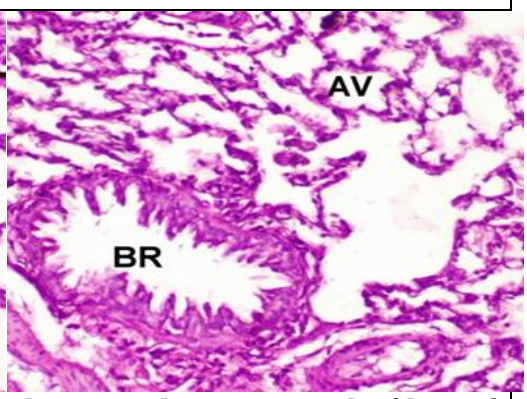

Photo (4): Photomicrograph of lung of rats from group 3 showing no histopathological alterations (normal bronchiole (BR) and alveoli (AV)) (H & E, x 200).

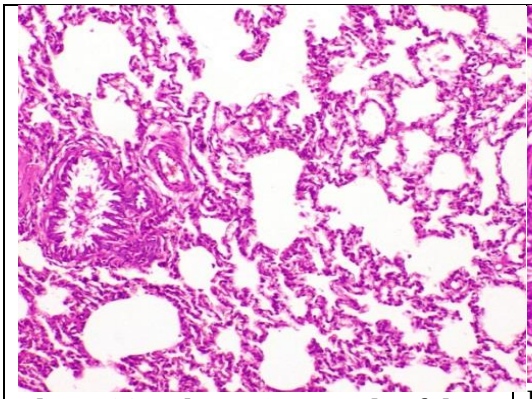

Photo (5): Photomicrograph of lung of rats from group 4 showing no histopathological alterations (H & E, x 100).

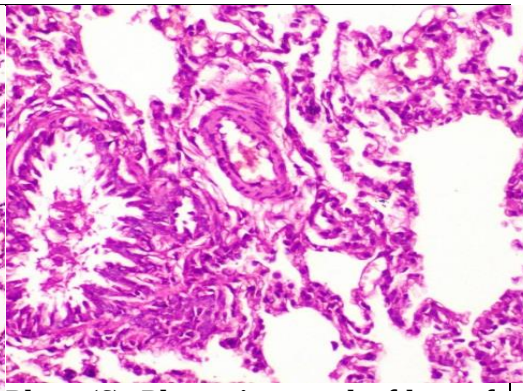

Photo (6): Photomicrograph of lung of rats from group 5 showing no histopathological alterations (H & E, x 200).

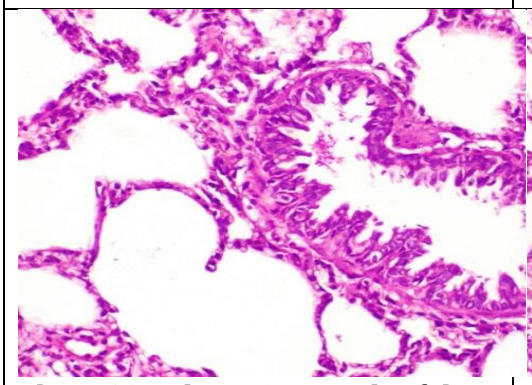

Photo (7): Photomicrograph of lung of rats from group 6 showing no histopathological alterations (H & E, x 200).

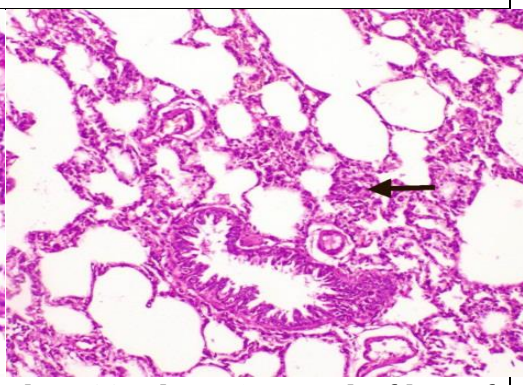

Photo (8): Photomicrograph of lung of rats from group 6 showing mild focal interstitial pneumonia (H & E, x 100).

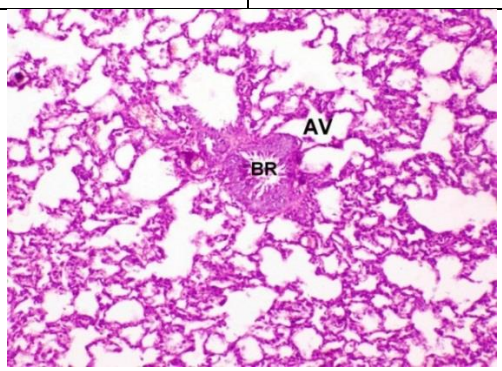

Photo (9): Photomicrograph of lung of rats from group 7 showing no histopathological alterations (normal bronchiole (BR) and alveoli (AV)) (H & E, x 100).

References

- Aguila MB, Sa Silva SP, Pinheiro AR, Mandarim-de-Lacerda CA (2004). Effects of long-term intake of edible oils on hypertension and myocardial and aortic remodeling in spontaneously hypertensive rats. J Hypertens.22:921–929
- Ardiansyah, Shirakawa H, Koseki T, Ohinata K, Hashizume K, Komai M (2006). Rice bran fractions improve blood pressure, lipid profile, and glucose metabolism in stroke-prone spontaneously hypertensive rats. J. Agric. Food Chem. 54, 1914–1920.
- Bancroft O, Stevens A and Turner R (1996). Theory and practice of histological techniques. 4th ed., Churchill Livingstone, Edinburg, London, Melbourne.
- Benkovic V, Knezevic AH, Orsolic N, Basic I, Ramic S, Viculin T, Knezevic F, Kopjar N (2009). Evaluation of radioprotective effects of propolis and its flavonoid constituents: in vitro study on human white blood cells. Phytother Res. 23:1159–1168.
- Chen PR, Chien KL, Su TC, (2005). Dietary sesame reduces serum cholesterol and enhances antioxidant capacity in hypercholesterolemia. Nutr Res .25(6):559-67.
- Chen T H, Du X L, Chan W, and Zhang K (2019). Impacts of cold weather on emergency hospital admission in Texas, 2004-2013. Environmental Research, 169, 139-146.
- Elleuch M, Besbes S, Roiseux O, Blecker C, and Attia H (2007). Quality characteristics of sesame seeds and by-products. J. of Food Chemistry, 103(2): 641-650.
- Erfan Sadeghi, Zohreh Ghotbeddin and Godratollah Mohammadi (2018). The effects of Sesame seeds on the pituitary-gonadal axis in adult male rats Discover the world's research 580-588
- Fossati P, Principe L (1982).Clin.Chem. PP :28,2077.
- Fraterrigo Garofalo S, Tommasi T , Fino D (2021). A short review of green extraction technologies for rice bran oil. Biomass Conv. Bioref. 11, 569–587.
- Fukai T, Siegfried MR, Ushio-Fukai M, Griendling KK, Harrison DG (1999). Modulation of extracellular superoxide dismutase expression by angiotensin II and hypertension. Circ Res. 85: 23–28.
- Gauthaman K.(2009). Nutraceutical value of sesame oil. Pharmacognosy Rev. 9;3(6):264
- Ghazani SM, Marangoni, AG (2016). Healthy Fats and Oils. Encyclopedia of Food Grains, VOL. 2, , pp. 1
- Goufo P, Trindade H (2014). Rice antioxidants: phenolic acids, flavonoids, anthocyanins, proanthocyanidins, tocopherols, tocotrienols, g-oryzanol, and phytic acid. Food. Sci. Nutr. 2, 75–104.

- Gupta M, Shaw BP (2009). Uses of medicinal plants in Panchakarma Ayurvedic therapy. Biochim Biophys Acta., 85: 23–28.
- Hong L, Yi W, Liangliang C, Juncheng H, Qin W, Xiaoxiang Z (2013). Hypoglycaemic and hypolipidaemic activities of sesamin from sesame meal and its ability to ameliorate insulin resistance in KK-Ay mice. J. Sci. Food Agric.;93:1833–1838.
- Hsu E, & Parthasarathy S (2017). Anti-inflammatory and Antioxidant Effects of Sesame Oil on Atherosclerosis: A Descriptive Literature Review. Cureus, *9*(7), e1438.
- Huang QS, Wood T, Jelley L, Jennings T,Jefferies S (2021). Impact of the COVID-19 nonpharmaceutical interventions on influenza and other respiratory viral infections in New Zealand. Nat. Commun., 12, p. 1001
- Ide T, Ashakumary L, Takahashi Y (2001). Sesamin a sesame lignan, decreases fatty acid synthesis in rat liver accompanying the down-regulation of sterol regulatory element binding protein-1. Biochim Biophys Acta., 30:1–13. 10.1016/S1388-1981(01)00167-6.
- International Committee for Standardization in Haematology (ICSH) (1967). Brit J Haemat., 13 (Suppl.) 71.
- Jan-on G, Sangartit W, Pakdeechote P, Kukongviriyapan V, Sattayasai J, Senaphan K, Kukongviriyapan U (2020). Virgin rice bran oil alleviates hypertension through the upregulation of eNOS and reduction of oxidative stress and inflammation in L-NAMEinduced hypertensive rats. Nutrition, 69: 110575.
- Joo SY, Park MJ, Kim KH (2016). Cold stress aggravates inflammatory responses in an LPS-induced mouse model of acute lung injury. Int J Biometeorol 60, 1217–1225.
- Kang H K and Kim C H (2016). Effects of dietary supplementation with rice bran oil on the growth performance, blood parameters, and immune response of broiler chickens -Journal of Animal Science and Technology pp 58:12
- Khadem Haghighian M, Alipoor B, Malek Mahdavi A, Eftekhar Sadat B, Asghari Jafarabadi M, Moghaddam A (2014). Effects of Sesame Seed Supplementation on Inflammatory Factors and Oxidative Stress Biomarkers in Patients with Knee Osteoarthritis. Acta Med Iran. 1;53(4):207-213.
- Koracevic D, Koracevic G, Djordjevic V, Andrejevic S, Cosic V (2001). J Clin . Pathol. 54, 356 – 361.
- Li X, Geng M, Peng Y, Meng L, and Lu S (2020). Molecular immune pathogenesis and diagnosis of COVID-19. J. Pharm. Anal. 10, 102–108.

- Masoudi A, Chagi M, Bojarpour M, Mirzadeh K. (2011) .Effects of different levels of date pits on performance, carcass characteristics and blood parameters of broiler chickens. J Appl Anim Res.;39:399–405.
- Moin VM (1986). A simple and specific method for determining glutathione peroxidase activity in erythrocytes]". Laboratornoe Delo. 12 (12): 7247. PMIDÂ 2434712.
- Monteiro EM, Chibli LA, Yamamoto CH, Pereira MC, Vilela FM, Rodarte MP.(2014). Antinociceptive and anti-inflammatory activities of the sesame oil and sesamin. Nutrients. 6(5):1931–44.
- Natt M P and Herrick C A, (1952). A new blood count diluent for counting erythrocytes and leukocytes of the chicken PoultSci 31: 735–738.
- Ogunsola OK, Fasola TR (2014). The antibacterial activities of Sesamum indicum Linn.leaf extracts. METHODS. Mar 28;18.
- Qian cheng, yudi mao, xiping ding (2021). Establishment of a mouse pneumonia model under cold stress- Food Science and Technology-0101-2061.
- Rafiee Shabnam, Faryabi Roghaye,Yargholi Alireza, Mohammad Ali Zareian, Hawkins Jessie (2021). Effects of Sesame Consumption on Inflammatory Biomarkers in Humans: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Evidence-based Complementary & Alternative Medicine (eCAM).:1-13.
- Reeves BG, Nielson F H, and Fahmy GC (1993). Reported of the American Institute of nutrition .Adhoc- writling committee on the reformulation of the A.I.N. 1979-Ardent Diet .J. Nutr. 123: 1939-1951.
- Rehab Tag Al-Deen, Rania Shams El Deen (2019). Potential effect of Sesame (Sesamum Indicum) seeds and oil on iron deficiency anaemia in rats. The second international conference of Elmenia University. pp 127-136
- Riantong Singanusong, Umar Garba (2019). Chapter 5 - Micronutrients in Rice Bran Oil‹Rice Bran and Rice Bran Oil, Editor(s): Ling-Zhi Cheong, Xuebing Xu, 177.
- Russo EB (2001). Handbook of psychotropic herbs: A scientific analysis of herbal remedies for psychiatric conditions. Binghamton, NY: The Haworth Herbal Press, Inc., 3-24
- Sadeghi N, Oveisi MR, Hajimahmoodi M, Jannat B, Mazaheri M, Mansouri S (2010) .The contents of sesamol in Iranian sesame seeds. Iranian J Pharm Res. :101–5

- Saikia D and Deka SC (2011). Cereals: from staple food to nutraceuticals - International Food Research Journal 18: 21-30
- Sakina Khatoon, Gopalakrishna A G (2004). Fat-soluble nutraceuticals and fatty acid composition of selected Indian rice varieties.Journal of American oil chemists society. Volume81, Issue10. Pp :939-943
- Sankar D, Ali A, Sambandam G, Rao R ((2011). Sesame oil exhibits synergistic effect with anti-diabetic medication in patients with type 2 diabetes mellitus. Clin Nutr. 30:351–358.
- Sankar Devarajan, Ravinder Singh, Biprabuddha Chatterjee, Bo Zhang, Amanat Ali (2015). A blend of sesame oil and rice bran oil lowers blood pressure and improves the lipid profile in mild-to-moderate hypertensive patient Journal of Clinical Lipidology 10, 339–349 s
- Sengupta A, Ghosh M, Bhattacharyya D K (2014). Antioxidative effect of rice bran oil and medium chain fatty acid rich rice bran oil in arsenite induced oxidative stress in rats. J Oleo Sci, 63(11): 1117-1124.
- Shakoor S, Ismail A, Sabran M R, Mohtarrudin N, Kaka U, Nadeem M (2021). In-vivo study of synthetic and natural food colors effect on biochemical and immunity parameters. Food Science and Technology, 1, 1-13.
- Tayade SK, Patil DA. (2006). Ethnomedicinal wisdom of tribals of Nandurbar district (Maharashtra). CSIR 0972-592X
- Thite SV, Chavan YR, Aparadh VT, Kore BA.(2013). Preliminary phytochemical screening of some medicinal plants. IJPCBS.3(1):87-90.
- Thomas L (1992). Labor and Diagnose, 4th .ed
- Tietz NW (1986). Textbook of Clinical Chemistry W.B. Saunders Co. London Pheladelphia. P ,796.
- Vignali DA (2000). Multiplexed particle-based flow cytometric assays. J Immunol Methods 243: 243–255.
- World Health Organization (WHO) (2020). From : https://www.who.int/news-room/fact-sheets/detail/pneumonia
- Yoshioka T, Kawada K, Shimada T, Mori M (1979). Lipid peroxidation in maternal and cord blood and protective mechanism against activated-oxygen toxicity in the blood. Am J ObstetGynecol, 135: 372–6.

- Zavoshy R, Noroozi M, Jahanihashemi H (2012). Effect of low calorie diet with rice bran oil on cardiovascular risk factors in hyperlipidemic patients.J Res Med Sci. 17(7):626–631
- Zhenwei Q, Yongbing Z, Dorthea B, Xiao L, Chansui W and Hongen J (2012). Sesame utilization in china: Newchaeobotanical evidence from xinjiang, Econ. Botany., 66(3):255-263.

الملخص العربي

دور زيت السمسم وزيت نخالة الارز في علاج التهاب الرئه المحدث بالهواء البارد في فئران التجارب

اعداد

مني سعيد القطري

قسم الاقتصاد المنزلي – كليه التربيه النوعيه – جامعه عين شمس – ج . م. ع

يقصد بالبونيميا التهاب الرئة .انة السبب الاكبرللعدوي و الوفاة لدي البالغين والاطفال . **هدف الدراسة:** هو معرفة دور زيت السمسم وزيت نخالة الأرز ضد الالتهاب الرئوي الناجم عن التعرض للهواء البارد والتغيرات التشريحية المرضية في ذكور الجرذان . **الطرق** : تلقت المجموعة الاولي العلاج الوهمي فقط لمدة 21 يومًا ؛ عرضت المجموعة الثانية لدرجة حرارة منخفضة من 4–5 درجة مئوية. المجموعة الثالثة اطعمت عن طريق الفم زيت السمسم بمقدار 5.0 جم / كجم من الوزن. المجموعه الرابعه : عرضت للهواء البارد بالإضافة اطعماها زيت السمسم بمقدار 5.0 جم / كجم من وزن الجسم. المجموعه الخامسة: اطعمت فقط زيت نخالة الارز بمقدار 5.0 جم / كجم. المجموعه السادسة: عرضت للهواء لبارد مع اطعمها فميا زيت نخالة الارز بمقدار 5.0 جم / كجم من وزن الجسم المجموعه السابعة: تعرضت للهواء البارد واطعمت فميا خليط من زيت السمسم وزيت نخالة الارز5.0 جم / كجم وزن الجسم (50% من كلا منهما) **النتائج** : مجموعة الفئران من مجموعات (3 الي 7) التي عولجت بزيت السمسم وزيت نخالة الأرز تحسنت معنويا ($p\leq0.05$) في مستويات الماخوذ الغذائي والوزن المكتسب ووزن الرئة و الهيموجلوبين وكرات الدم البيضاء والجلوكوز مقارنة بالمجموعه الثانية . واشارت النتائج ان هناك زيادة معنوية ($p\leq0.05$)في مستويات عامل الالتهاب والسيتوكينات IL–1 alpha و IL–6 و TNF– α و IgE في المجموعه الثانية مقارنة بالمجموعات التي عولجت بزيت السمسم اوزيت نخالة الارز او مخلطوهما ونتائج فحص الانسجة دعمت هذه النتائج .

الخلاصة : زيت السمسم \ زيت نخالة الارز او خليطهما تقلل عمليات الاكسدة في الدم وانسجة الرئة و مؤاثرات الالتهاب ومستويات السيتوكينات و IgE لذلك يجب تضمينها في النظام الغذائي والاغذية المصنعة خاصة لاطفال والرضع وكبار السن. وقد ننصح بها في الانظمة الغذائية في الامراض المناعية والحساسية والسكري.

الكلمات المفتاحية:

التهاب الرئة – زيت السمسم – زيت نخالةالارز –الالتهابات– السيتوكينات– الفئران