



PROCEEDINGS

The 4th International Conference on Sustainable Innovation (ICoSI) 2020

Cutting Edge Innovations for Sustainable Development Goals

Universitas Muhammadiyah Yogyakarta (Indonesia)

October 13 - 14 2020

<https://icosi.umy.ac.id/>

Focal Conferences



- ✔ (ICPU) The 2nd International Conference on Pharmaceutical Updates
- ✔ (ICOMS) The 6th International Conference on Management Sciences
- ✔ (ICLAS) The 9th International Conference on Law and Society
- ✔ (ICMHS) The 4th International Conference Medical and Health Sciences
- ✔ (ICAF) The 6th International Conference for Accounting and Finance
- ✔ (ILEC) The 2nd International Language and Education Conference
- ✔ (ICONURS) The 2nd International Conference on Nursing
- ✔ (ICITAMEE) The 1st International Conference on Information Technology, Advanced Mechanical and Electrical Engineering
- ✔ (IConARD) International Conference on Agribusiness and Rural Development
- ✔ (ISHERSS) The 2nd International Symposium on Social Humanities Education and Religious Sciences
- ✔ (ICONPO) The 10th International Conference on Public Organization
- ✔ (DREAM) The 5th Dental Research and Exhibition Meeting
- ✔ (ICHA) The 5th International Conference on Hospital Administration
- ✔ (ICOSA) The 3rd International Conference on Sustainable Agriculture





Proceedings

4th International Conference on Sustainable Innovation

2020

Publisher UMYPress

Lembaga Penelitian, Pengabdian, dan Pengembangan Masyarakat (LP3M)

Universitas Muhammadiyah Yogyakarta

Address

Gedung D Lantai 2

Universitas Muhammadiyah Yogyakarta

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55183 Indonesia

ISBN : 978-623-7054-43-6



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Preface by the Chairperson of the 4th ICoSI 2020



Dr. Yeni Rosilawati, S.IP. S.E., MM.

Assalamu'alaikum Wr. Wb.

All praise is due to Allah, the Almighty, on whom we depend for sustenance and guidance. Prayers and peace be upon our Prophet, Muhammad SAW, his family and all of his companions.

On behalf of the organizing committee, it is my pleasure and privilege to welcome the honourable guests, distinguished keynote & invited speakers, and all the participants.

With the main theme of “Cutting-Edge Innovations on Sustainable Development Goals (SDGs)”, the 4th International Conference on Sustainable Innovation (ICoSI) 2020 serves as a forum to facilitate scholars, policy makers, practitioners, and other interested parties at all levels from Indonesia and abroad to present their novel ideas, promote cutting-edge research, and to expand collaboration network. The conference has about 1373 participants participating from more than 8 countries 4 continents all over the world, making this conference a truly international conference in spirit.

This multidisciplinary conference was first held in 2012 and has undertaken various changes and adopted to the current technological trends of our education system. From having this conference with just 175 participants back in 2012 we have come a long way in making the conference a huge success with more than 1373 participants participating in this two-day conference.

Formerly, this conference consisted of only 9 (nine) focal conferences. This year, there are 14 focal conferences from various disciplines, namely: 1) The 2nd International Conference on Pharmaceutical Updates (ICPU), 2) The 6th International Conference on Management Sciences

(ICoMS), 3) The 9th International Conference on Law and Society (ICLAS), 4) The 4th International Conference Medical and Health Sciences (ICMHS), 5) The 6th International Conference for Accounting and Finance (ICAF), 6) The 2nd International Language and Education Conference (ILEC), 7) The 2nd International Conference on Nursing (ICONURS), 8) The International Conference on Information Technology, Advanced Mechanical and Electrical Engineering (ICITAMEE), 9) The 2nd International Conference of Agribusiness and Rural Development (IConARD), 10) The 10th International Conference on Public Organization (ICONPO), 11) The 2nd International Symposium on Social Humanities Education and Religious Sciences (ISHERSS), 12) The 5th Dental Research and Exhibition Meeting (DREAM), 13) The International Conference on Hospital Administration (ICHA), and 14) The 3rd International Conference on Sustainable Agriculture (ICoSA).

Accordingly, We are proud to announce that this year, the 4th ICoSI 2020 breaks the Museum Rekor-Dunia Indonesia (MURI) record as the Virtual Multidisciplinary Conference with the Largest Number of Area of Fields in Indonesia

In addition, this year, this conference holds special value since this is the first conference in the history of our university where the entire conference is taking place remotely on a digital platform through the use of advance technologies due to the Covid-19 Pandemic.

I would take this opportunity to express my highest respect to the Rector of Universitas Muhammadiyah Yogyakarta, Dr. Gunawan Budiyanto who gave approval and ensured the maximal support from all the faculty members of Universitas Muhammadiyah Yogyakarta (UMY) that made this event a big success. In addition, my appreciation goes to all the support teams who have provided their valuable support and advice from planning, designing and executing the program.

Let me conclude my speech by encouraging the delegates to participate with an increasing number in all the activities and discussions through the digital platforms for the next two days. I wish everyone a successful, safe, and fruitful conference.

Thank you!

Wassalamu'alaikum Wr. Wb.

Yogyakarta, Indonesia, 14 October 2020



Welcoming Remarks by the Rector of Universitas Muhammadiyah Yogyakarta



Assoc. Prof. Dr. Gunawan Budiyanto

Innovation is the beginning of the development of technology, and technology is a development machine that is expected to provide benefits to humans and provide the smallest possible impact on environmental quality. In the concept of sustainable development, development must improve the quality of human life without causing ecological damage and maintain the carrying capacity of natural resources.

International Conference on Sustainable Innovation (ICoSI) is an international conference which is an annual conference held by the University of Muhammadiyah Yogyakarta (UMY), Indonesia. In 2020 this raises the issue of "Cutting-Edge Innovations on Sustainable Development Goals." Therefore, on behalf of all UMY academics, I would like to congratulate you on joining the conference, hoping that during the Covid-19 Pandemic, we can still provide suggestions and frameworks for achieving sustainable development goals.

About The 4th International Conference on Sustainable Innovation (ICoSI) 2020

Cutting Edge Innovations for Sustainable Development Goals

The 2030 Agenda for Sustainable Development is enacted by the United Nations as a shared blueprint for peace and prosperity for people and the planet, now and into the future. It consists of strategies to improve health and education, reduce inequality, and spur economic growth while also conserving natures by 2030.

This year, however, at the first one-third of its timeline, the SDG Reports shows that the outbreak of COVID-19 did hinder the achievement, or at least decelerate the progress of achieving the 17 goals. In fact, according to the report, “some number of people suffering from food insecurity was on the rise and dramatic levels of inequality persisted in all regions. Change was still not happening at the speed or scale required”, accordingly.

Therefore, in this event of pandemic, the quantity and quality of research, innovation, and more importantly multi-disciplinary collaboration are indispensable. Furthermore, there needs to be clear ends of those works. That is how those research are applicable and benefits directly to the society. That is how those research is incorporated as the drivers of policy making, and used practically in the society. Hence, the stakeholders especially the triple helix of higher education institution, government, and industry must be re-comprehended and supported to reach the common goal of the SGD.

International Conference on Sustainable Innovation (ICoSI) has been essentially attempting to strengthen this regard since its first establishment. One of the goals of ICoSI is to provide primarily a platform where scholars, practitioners, and government could grasp the development and trends of research. Hopefully, meeting these actors altogether would result in stronger collaboration, sophisticated and advantageous research, and brighter ideas for further research. Based on these reasoning, this year, the 4th ICoSI 2020 UMY is themed ‘Cutting-edge Innovations for Sustainable Development Goals’.

Improving from last year conference which brought nine focal conference, this year ICoSI 2020 UMY brings 14 disciplines, from social sciences, natural sciences, and humanities. ICoSI 2020 received as much as 1005 papers. The paper works submitted in ICoSI 2020 UMY will be published in Atlantis Proceedings, IOP Proceedings, National/International Journals, and ICoSI ISBN-indexed Proceedings.

Nevertheless, ICoSI believes that publication is only the beginning of research dissemination. The publications will enhance the chance of the research known by wider audience, and then used, applied, and incorporated at either system, institutional, or personal level of human lives.





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TRACK ECONOMICS, LAW, EDUCATION, SOCIAL, AND HUMANITIES



The Effect of *Phoenix Dactylifera* Pollen on Histology Liver of *Rattus norvegicus* Exposed with Air Fresheners

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ABSTRACT

Air freshener contains formaldehyde that has toxic effects on the liver. The damage can be reduced by antioxidants. Date palm pollen contains flavonoids and phytochemicals that are known to have hepatoprotective effects. This research aimed was to assess the effectiveness of date palm pollen on liver histology due to exposure of air freshener. A quasi-experimental study with a post-test only controls group design. Thirty two male rats (*Rattus norvegicus*) divided into eight groups, the control group (C); exposed air freshener 4 hours/day (P); given date palm pollen with a dose of 120 mg/kg BW, 240 mg/kg BW, and 360 mg/kg BW (K1, K2, K3); and exposed to air freshener 4 hours/day and given date palm pollen with a dose of 120 mg/kg BW, 240 mg/kg BW, and 360 mg/kg BW (PK1, PK2, PK3). The treatment of the subject given for 30 days. The liver histological damage assessed use Manja Roenigk's scoring. Data analysis used statistical tests One Way ANOVA and post hoc Duncan. Exposure to date palm pollen has a positive effect on reducing liver histology damage scores in K2, K3, PK1, PK2, and PK3 groups, indicated by the absence of significant differences with C group. Group K1 had a score approach P group that significantly different from the C group.

Keywords : air freshener, *Phoenix dactylifera*, liver histology

1. INTRODUCTION

Air pollution by air pollution hurts health. Apart from outdoor air pollution, indoor air pollution hurts people spending more than 80% of their time indoors. One of the sources of indoor air pollution is an air freshener. Excessive use of air fresheners can be harmful to health because air fresheners contain toxic substances including benzene, toluene, terpenes, benzyl alcohol, formaldehyde, xylene, and phthalates¹. Formaldehyde contained in room deodorizers is reactive and interferes with the oxidative phosphorylation process, which triggers the production of reactive oxygen species (ROS). and so that the content of free radicals encourages necrosis of hepatic cells².

The damage described above can be reduced by antioxidants. One of them is date pollen which contains various phytochemicals, namely phenolic acid, quercetin, rutin, vitamin C, and vitamin E which are known to have hepatoprotective effects so that they have the potential to reduce liver damage³.

This study aims to examine the potential of date palm pollen (*Phoenix dactylifera*) in repairing liver histological damage in male white rats (*Rattus norvegicus*) Wistar strain due to exposure to air freshener.

2. MATERIALS AND METHODS

This study used a purely experimental research design with a post-test only control group design. The study was conducted on 32 male white rats (*Rattus norvegicus*) Wistar strain aged 1 month and weighing 100 - 150 grams. The experimental animals were randomly divided (Simple

Random Sampling) into 8 groups consisting of a control group (C); exposed to air freshener 4 hours / day (P); given pollenated dates with a dose of 120 mg / KgBW, 240 mg / KgBW, and 360 mg / KgBW (K1, K2, K3); and exposed to air freshener 4 hours / day and given date pollen at a dose of 120 mg / KgBW, 240 mg / KgBW, and 360 mg / KgBW (PK1, PK2, PK3). All of the treatment was given one time per day.

The test animals were acclimatized for 7 days before being given treatment. All groups were given the treatment for 30 days, then performed anesthesia and surgery for the experimental animals to extract their hepatic organs. The liver organs were fixed in a 10% buffered formalin solution, then histological preparations were made using the paraffin block technique using Hematoxylin and Eosin (HE) staining. The preparations were observed in 100 liver cells around the central vein with a magnification of 40 x 10 times in 5 visual fields. The liver cell damage that occurs is scored based on Manja Roenigk's histopathological scoring then the total damage score is calculated. The criteria observed included, normal score 1), parenchymal degeneration (score 2), hydropic degeneration (score 3), and necrosis (score 4). The data obtained were analyzed for the distribution of the data using Shapiro-Wilk followed by one- way ANOVA parametric statistical test and Duncan's post hoc.

3. RESULT

The results of observing preparations using a microscope that represents each group can be seen in the following figure:

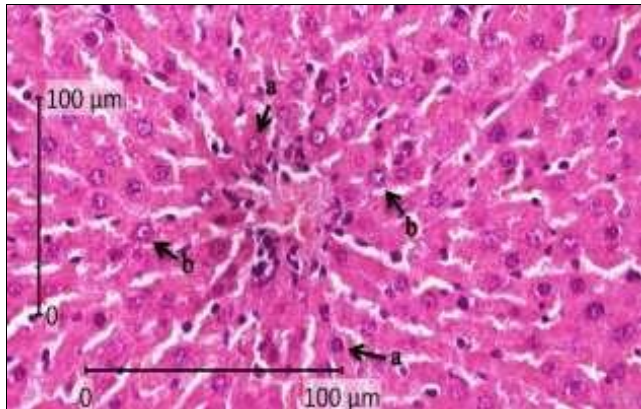


Fig. 1. Liver histology of *Rattus norvegicus* control group (HE, 400x).

Notes: (a) indicate normal liver cells with a score of 1, (b) indicate liver cells that have parenchymal degeneration with a score of 2.

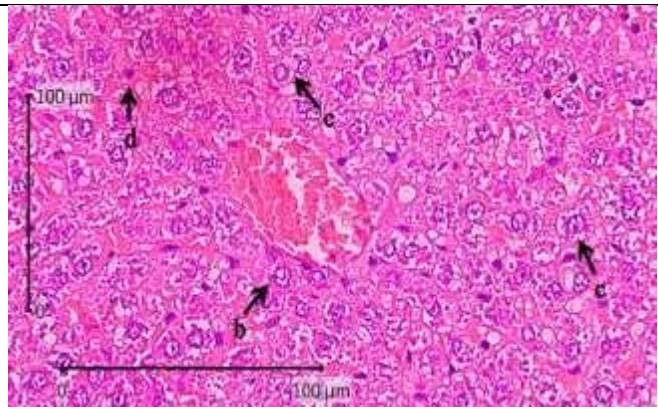


Fig. 2. Liver histology of *Rattus norvegicus* in the group exposed to air freshener 4 hours / day (HE, 400X).

Notes: (b) show that the liver cells that have parenchymal degeneration with a score of 2, (c) show that the liver cells are experiencing hydropic degeneration with a score of 3, (d) show that the liver cells are experiencing necrosis with a score of 4.

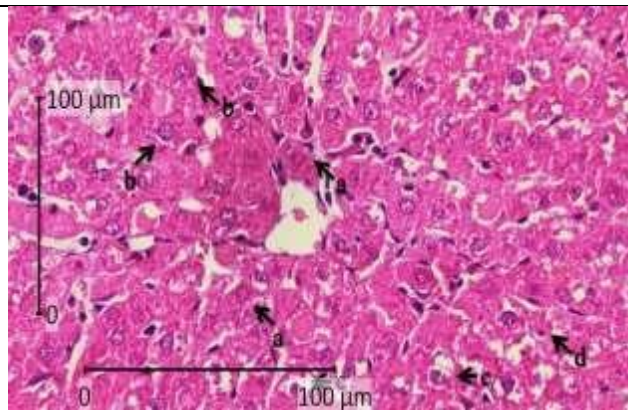


Fig. 3. Liver histology of *Rattus norvegicus* group given date palm pollen 120 mg / KgBW (HE, 400X)

Notes: (a) indicate normal liver cells with a score of 1, (b) indicate liver cells that have parenchymal degeneration with a score of 2, (c) indicate liver cells that have hydropic degeneration with a score of 3, (d) indicate liver cells that have necrosis with a score of 4.

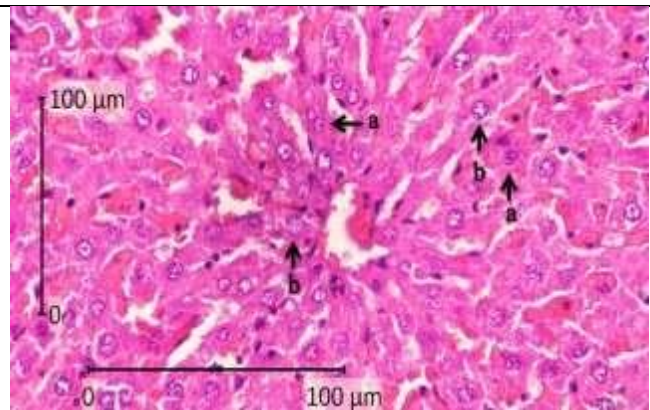


Fig. 4. Hepatic histology of *Rattus norvegicus* group given date palm pollen 240 mg / KgBW (HE, 400X)

Notes: (a) indicate normal liver cells with a score of 1, (b) indicate liver cells that have parenchymal degeneration with a score of 2.

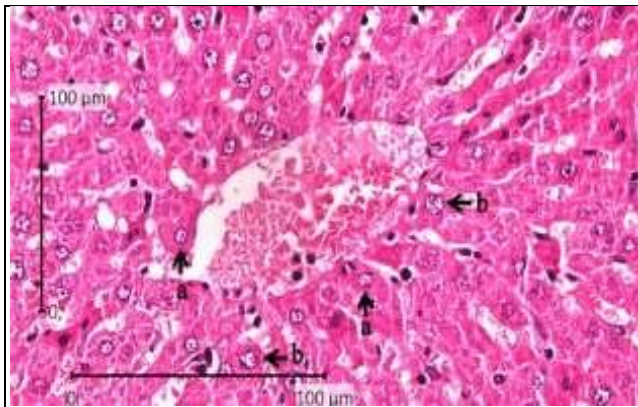


Fig. 5. Liver histology of *Rattus norvegicus* group given date palm pollen 360 mg / KgBW (HE, 400X)
Notes: (a) indicate normal liver cells with a score of 1, (b) indicate liver cells that have parenchymal degeneration with a score of 2.

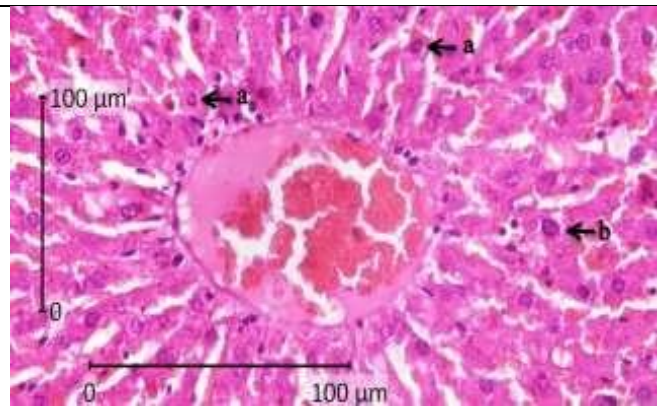


Fig. 6. Hepatic histology of *Rattus norvegicus* group given air freshener 4 hours / day and date palm pollen 120 mg / KgBW (HE, 400X).
Notes: (a) indicate normal liver cells with a score of 1, (b) indicate liver cells that have parenchymal degeneration with a score of 2.

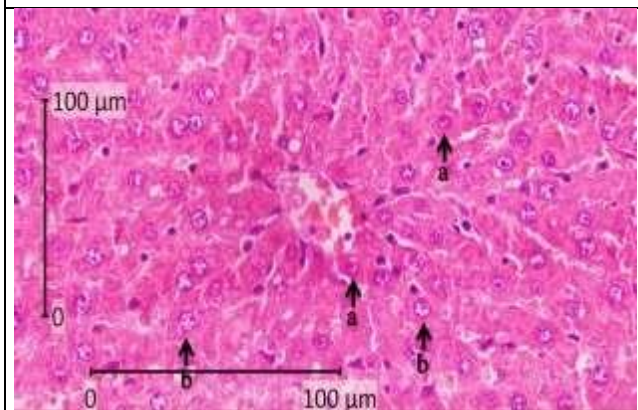


Fig. 7. Hepatic histology of *Rattus norvegicus* group given air freshener 4 hours / day and date palm pollen 240 mg / KgBW (HE, 400X)

Notes: (a) indicate normal liver cells with a score of 1, (b) indicate liver cells that have parenchymal degeneration with a score of 2.

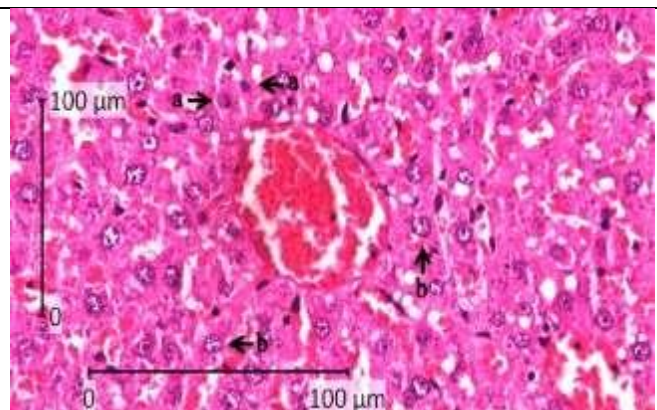


Fig. 8. Hepatic histology of *Rattus norvegicus* group given air freshener 4 hours / day and date palm pollen 360 mg / KgBW (HE, 400X)

Notes: (a) indicate normal liver cells with a score of 1, (b) indicate liver cells that have parenchymal degeneration with a score of 2.

Observations on 5 visual fields around the central vein obtained the mean (x) data which were tested using the Shapiro-Wilk method because the number of samples was 40 (N = 40, N < 50). The results of the data distribution test in the control group (C) $p = 0.095$ ($p > 0.05$), the air freshener group

(P) $p = 0.595$ ($p > 0.05$), the date palm pollen group 120 mg / kg (K1) $p = 0.564$ ($p > 0.05$), date palm pollen group 240 mg / kg (K2) $p = 0.484$ ($p > 0.05$), date palm pollen group 360 mg / kg (K3) $p = 0.402$ ($p > 0.05$), the air freshener group and date palm pollen 120 mg / kg (PK1) $p = 0.318$ ($p > 0.05$), the room freshener group and date palm pollen 240 mg / kg (PK2) $p = 0.406$ ($p > 0.05$), while air freshener group and date palm pollen 360 mg / kg (PK3) $p = 0.088$ ($p > 0.05$). The results of the significance value (p) indicate that the data distribution is normal.

Data processing was continued with a parametric statistical test using the One Way ANOVA test which showed the value of $p = 0.000$ ($p < 0.05$). These data indicate that the results are significant or there are significant differences in scores between the eight groups being

compared. Meanwhile, to determine the presence or absence of differences in the histology of the liver in each group using Duncan's post hoc test. The highest average hepatic histological damage score was in the air freshener group (P), while the lowest was in the air freshener group and date palm pollen 120 mg / KgBW (PK1). Significant differences were found between the control group (C) and the air freshener group (P) and date palm pollen 120 mg / KgBW (K1). However, there were no significant differences with other groups. The average histological liver damage score can be seen in the following table.

Average Histological Liver Damage Score ($X \pm Sd$) Of Rattus Norvegicus In The Study Group After Being Exposed To Air Freshener For 4 Hours / Day And Given Date Pollen At A Certain Dose For 30 Days:

Group	Histological liver damage score ($x \pm SD$)
Control (C)	215,5000 \pm 13,37909 ^a
Air freshener (P)	294,5000 \pm 28,54820 ^b
Date pollen 120 mg / KgBW (K1)	283,0000 \pm 16,45195 ^b
Date pollen 240 mg / KgBW (K2)	211,0000 \pm 15,03330 ^a
Date pollen 360 mg / KgBW (K3)	219,7500 \pm 23,37199 ^a
Air freshener and date palm pollen 120 mg / KgBW (PK1)	207,0000 \pm 29,08608 ^a
Air freshener and date palm pollen 240 mg / KgBW (PK2)	232,2500 \pm 1,25831 ^a
Air freshener and date palm pollen 360 mg / KgBW (PK3)	230,0000 \pm 16,26858 ^a

Fig. 9. Information: a, b, different letters show significant differences and the same letter shows no significant difference in the Kruskal Wallis statistical test with a significance level of 95%

4. DISCUSSION

The liver is a metabolic organ that can be called the body's main biochemical factory. This organ has various functions, one of which is detoxifying waste products, hormones, drugs, or compounds that are considered foreign by the body. The liver also functions as a storage place for blood. Kupffer cells or macrophages found in the liver are responsible for cleaning the blood as it passes through the hepatic sinus⁵. The liver is the first organ that toxic substances reach through the bloodstream in the portal vein after being absorbed by the intestinal epithelium. The accumulation of toxic substances in the liver parenchyma can cause damage to the hepatocytes and histopathological changes⁶.

This study shows that in the control group (C), normal liver cells and liver cell damage is found, namely parenchymal degeneration. In theory, the condition of the liver cells in the group (C) is normal. Parenchymatous degeneration that occurs can be influenced by internal factors such as the resistance and susceptibility of different rats or external factors such as less than ideal cage conditions, the stress in mice, the influence of substances, or other diseases⁷. Parenchymal degeneration is the mildest degeneration, reversible, characterized by swelling of hepatocytes with red cytoplasm due to protein accumulation 2. The liver cell damage score in the group (C) is considered normal because it is used as a comparison for other groups.

The damage that occurs to the liver cells slows or hinders the detoxification process so that the liver cells that have not finished working will continue to be exposed to toxic substances. One of the toxic substances contained in air freshener is formaldehyde. The toxic effect of formaldehyde is systemic and has an organotypic effect on tissues and organs that are located far from the initial site of entry of this compound into the body⁸. Exposure to formaldehyde will lead to the production of Reactive

Oxygen Species (ROS) and free radicals which will activate cell defence mechanisms, thus triggering oxidative stress or cell injury⁹.

The liver cell damage score in the air freshener group (P) gave the highest score compared to other groups. Hepatic cell features show parenchymal degeneration, hydropic degeneration, and necrosis. This is consistent with study⁸, which showed similar damage in groups of mice exposed to gel or spray air freshener. The damage is caused by formaldehyde in-room deodorant which interferes with the oxidative phosphorylation process, thus producing reactive oxygen species (ROS) and free radicals². Formaldehyde exposure affects the liver by damaging the mitochondria so that the aerobic metabolism of the liver cells is disrupted¹⁰.

Formaldehyde in room deodorizer can enter the body through ingestion through food and is quickly absorbed because it is very reactive and easily dissolves in water. The food that enters is then absorbed by the intestine and then enters the venous bloodstream. Formaldehyde that has entered the liver is metabolized into formic acid by the enzyme formaldehyde dehydrogenase, which is found in the cytosol

and mitochondria of liver cells. Formic acid can inhibit cytochrome oxidase resulting in reduced ATP synthesis and histotoxic hypoxia. As a result, tissue oxygenation is reduced due to impaired aerobic respiration¹¹.

In addition to degeneration, the liver cells of the rat group that were exposed to air freshener also showed cytoplasmic vacuolation. This observation is consistent with previous studies which state that formaldehyde that enters the portal bloodstream causes activated Kupffer cell accumulation, sinusoid dilation, liver cell cytoplasm vacuolation, and blood capillary congestion¹². Other studies have suggested that the liver tissue exposed to formaldehyde has enlarged sinusoids that fill with blood, loses cytoplasm, and has a hyperchromatic nucleus. The vacuolation that occurs is most likely a defense mechanism against toxic substances. The toxic substances that are present accumulate in the vacuole and are prevented from affecting cellular metabolism¹³.

The damage caused by oxidative stress can be prevented by flavonoids which are normally found in plants and cannot be synthesized by the human body. Date pollen contains various phytochemicals that can ward off free radicals from toxic substances that enter the body. The flavonoids in date palm pollen function as hepatoprotection that inhibit the activity of cytochrome P-45014 aromatase. The hepatoprotection effect of date pollen was seen in the group of date palm pollen 240 mg / KgBW and 360 mg / KgBW (K2 and K3). Both groups had liver cell damage scores close to the controls which were considered normal. However, in the 120 mg / KgBW (K1) date palm pollen group, there was a significant difference with the increase in the liver cell damage score almost close to the air freshener group (P). This is different from the research conducted by Mehraban et al., Where the dose of 120 mg / KgBW was even more positive. In this study, the dose of 120 mg /

KgBW was not yet effective in reducing the histological liver damage score. This difference was influenced by the bodyweight of the K1 group rats which tended to fluctuate during treatment in this study. This condition is possible because there is an internal influence from the test animals such as the resistance and susceptibility of different mice which can affect the work of the liver in metabolizing date pollen⁷.

Meanwhile, there was a significant difference between the air freshener group (P) and the air freshener group and date palm pollen 120 mg / KgBW, 240 mg / KgBW, and 360 mg / KgBW (PK1, PK2, PK3). The three groups showed a lower score of liver cell damage than the P group with the PK1 group having the lowest score followed by PK3 then PK2, but between the three there was no significant difference. These results are consistent with the research of Nady et al., Which showed improvements in the liver cells of mice treated with date palm pollen which were previously exposed to the smoke of air freshener incense. Another study also showed the same thing, mice that were given date pollen had minimal liver cell damage after previously being exposed to CCl₄ as an oxidative stress factor¹⁴.

This is because date pollen containing flavonoids and phytochemicals such as phenolic acid, quercetin, vitamin C, and vitamin E acts as an antioxidant that inhibits the aromatase activity of cytochrome P-450 so that liver cell regeneration occurs. The content of α -tocopherol (vitamin E) can reduce peroxidase radicals and protect cell membranes from oxidation. Quercetin has an anti-oxidative mechanism by increasing the absorption of vitamin C¹⁴. Previous research has stated that the components of antioxidants and vitamin C can reduce liver cell damage due to exposure to chemical substances in certain animals. Vitamin C is a powerful antioxidant that binds various free radicals such as superoxide, hydroxyl, and hydrogen peroxide¹⁷.

This study showed that the best dose of date pollen was 120 mg / KgBW in the air freshener group and 120 mg / KgBW (PK1) date palm pollen which had the smallest liver cell damage score, followed by 360 mg / KgBW in the air freshener group and 360 mg of date palm pollen. / KgBW (PK3) and 240 mg / KgBW in the air freshener group and 240 mg / KgBW (PK2) pollen. Slightly different from previous studies with the same dosage of date palm pollen, doses of 120 mg / KgBW and 240 mg / KgBW gave better results, with parameters of sperm count and reproductive hormones, compared to doses of 360 mg / KgBW (Mehraban et al., 2014). This difference can be caused by the different conditions of the rat between the PK2 and PK3 groups and the presence of exposure to air freshener so that a higher dose is needed to overcome the toxic effects of air freshener content.

The limitation of this study is that the liver organs of the rats were not examined before sampling so that there is a possibility of organ damage before the study was carried out. This can be seen in the control group (C) who also experienced parenchymal degeneration.

5. CONCLUSION

The provision of date palm pollen (*Phoenix dactylifera*) 120 mg/Kg BW, 240 mg/Kg BW, and 360 mg/Kg BW had a positive effect on reducing the histological damage to the liver of white rats (*Rattus norvegicus*) exposed to air freshener, assessed based on Manja Roenigk's histological liver damage score.

6. SUGGESTION

- 1) It is necessary to carry out further research on the effect of giving date palm pollen in other forms, different doses, frequency of administration in a day, and the number of days of administration to *Rattus norvegicus* liver cells.
- 2) A second observer by an anatomical pathologist is needed to reduce the possibility of bias in the observation.
- 3) It is necessary to use a more representative test room so that the test results are more effective.

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