PRINT ISSN 1119-8362
Electronic ISSN 2659-1499

Full-text Available Online at
https://www.ajol.info/index.php/jasem
https://www.bioline.org.br/ja

J. Appl. Sci. Environ. Manage.
Vol. 28 (7) 2167-2172 July 2024

Evaluation of Antioxidant Properties of *Cucumeropsis Manni* (Melon) Oil and Its Effect on Organs to Body Weight Ratio

[1]OMOZUWA, OP; [2]UKHUN, ME; *[1]IGBASHIO, MD

*[*1]Department of Science Laboratory Technology, Faculty of Life Sciences, University of Benin, Benin City, Nigeria.*
[2]Department of Chemistry, Faculty of Physical Sciences, University of Benin, Benin City, Nigeria.

*Corresponding Author Email: *Mercy.igbashio@uniben.edu*
**ORCID: https://orcid.org/0009-0009-0011-5362*
**Tel: +2348032761520*

Co-Author Email: *precious.omozuwa@uniben.edu*

ABSTRACT: It has been earlier reported that *Cucumeropsis mannii* seed oil is rich in unsaturated fatty acids, antioxidants, and minerals and cholesterol-free, and has a lot of medicinal and nutritional benefits. Hence, the objective of this paper is to evaluate the antioxidant properties of *Cucumeropsis manni* (Melon) oil and its effect on organs to body weight ratio of male albino rats using various standard methods. The results revealed that *Cucumeropsis mannii* seed oil possesses antioxidant potential and did not cause any change in the internal organ weight, suggesting that the consumption of *C. mannii* seed oil is safe and will also prevent cellular damage.

DOI: https://dx.doi.org/10.4314/jasem.v28i7.30

Cite this Article as: OMOZUWA, O. P; UKHUN, M. E; IGBASHIO, M. D (2024). Evaluation of Antioxidant Properties of *Cucumeropsis Manni* (Melon) Oil and Its Effect on Organs to Body Weight Ratio. *J. Appl. Sci. Environ. Manage.* 28 (7) 2167-2172

Dates: Received: 21 May 2024; Revised: 17 June 2024; Accepted: 23 June 2024 Published: 02 July 2024

Keywords: *Cucumeropsis mannii* seed; edible oil; antioxidant; organ weight

Antioxidants are naturally occurring compounds that are present in our foods (Mamta *et al*., 2014). They aid in the battle against reactive oxygen species, which cause cell damage in the body and are linked to a number of heart-related issues as well as the pathogenesis of many diseases. Examples of antioxidants include vitamins A, C, and E. Based on their solubility, antioxidants are broadly classified into two groups: water-soluble and lipid-soluble. Examples of water-soluble antioxidants are ascorbic acid, glutathione, uric acid, lycopene, proteins, and low-molecular-weight antioxidants. Examples of lipid-soluble antioxidants are vitamin E, coenzyme Q10, and carotenoids (Katerina *et al*., 2020). Oxidative stress is a crucial factor in the progression of cancer as well as other diseases associated with excess generations of free radicals that are harmful to body organs. Dietary induced-oxidative stress may result due to an imbalance between protective antioxidants and free radical production due to poor nutrition (Darshini *et al*., 2023). Edible plant oils are an indispensable nutritional resource for human health (Ying *et al.*, 2020).The utilisation of plant oils by a vast majority of the constantly growing world population has led to an increase in the price and demands of these edible oils and has prompted people to find alternatives for non-conventional sources of oil with essential health benefits, especially in developing nations. A number of understudied plants are known to possess oil-rich seeds that can be used for commercial or consumable purposes (Sabikhi and Kumar, 2012). Edible seed oils are utilised for frying and cooking in various nations in Western Africa and are also used in small amounts for cosmetics, health supplements, and capsules (Ying *et al*., 2020). When used in cooking, seed oils were suggested to contain a

*Corresponding Author Email: *Mercy.igbashio@uniben.edu*
**ORCID: https://orcid.org/0009-0009-0011-5362*
**Tel: +2348032761520*

wide array of phytochemical compounds (such as phenols alkaloids, flavonoids, saponins, terpenoids, etc.) that have exact physiological actions on humans and animals and have been linked to good health. These phytochemicals are also proposed to contain antioxidants, which help protect the organs of the body from oxidative damage caused by free radicals (Lillehoj and Lee, 2012).

Cucumeropsis mannii, commonly known as the white melon seed, is a member of the Cucurbitaceae family. The plant thrives in tropical and sub-tropical regions and is native to tropical West Africa. It produces climbing vines up to 4 m long, which are covered in stiff hairs. As a climber, it produces well when inter-planted with tall-growing plants and trees, reducing land degradation associated with the cultivation of many oil crops (Ezema *et al*., 2023). *C. mannii* is popularly known in Nigerian local languages as “egusi” in Ibo and “cheegh” in Tiv.

The fruit and white seed of the plant are edible. The seeds are commonly processed into soups and oil products. Studies have revealed that *Cucumeropsis mannii* is free of cholesterol, high in antioxidants, fatty acids, and minerals, and offers excellent health and nutritional advantages. Numerous ailments, including digestive problems, bacterial infections, jaundice, asthma, and diabetes, have all been treated with it. According to studies, it contains a number of vital micronutrients and polyphenolic chemicals that help prevent a number of chronic illnesses and also possess analgesic and anti-inflammatory activity (Yang *et al*., 2011). Melon seed has also been suggested to possess anti-angiogenic and antidiabetic activity. Melon aids digestion and regulates bowel movement. It possesses anticarcinogenic activity because of the active ingredient; cucurbitacin glycosides, which has been shown to have a pleiotropic impact, killing cancer cells and preventing their spread (Silvia *et al*., 2020). Melon oil itself is low in cholesterol; hence, because it contains unsaturated fatty acids, it lowers blood cholesterol levels, protecting and maintaining heart health. There are insulinotropic qualities in every portion of the plant, it can help people with diabetes because they stimulate the response of insulin; hence, melon is known to contain antidiabetic properties and lower cholesterol (Wang *et al*., 2018). Nwoke *et al*. (2023) reported that *Cucumeropsis manni is* rich in bioactive compounds such as tocopherols, squalene, polyphenols, and carotenoids, which are antioxidants that scavenge free radicals and prevent cellular damage. Phytosterols present in the seed have cholesterol-lowering properties, thus supporting cardiovascular health; omega-3 and omega-6 fatty acids are also beneficial for heart health. Hence, the objective of this paper is to evaluate the antioxidant properties of *Cucumeropsis manni* (Melon) oil and its effect on organs to body weight ratio.

MATERIALS AND METHODS

Plant sample collection: The plant sample, *C. mannii* melon, was purchased from New Benin Market, Benin-City, Edo State, Nigeria, and verified at the Department of Plant Biology and Biotechnology, University of Benin, Benin City. It was washed and cut with a kitchen knife, and the seeds were extracted from the pulp and dried under the sun for five days. The seeds were grounded using a Corona grinder and stored in an airtight container until further analysis. The already-processed Okomu palm oil and Goya olive oil were gotten from the same market. All oils were stored at room temperature.

Melon seed Oil Processing: The steps involved in this process are de-hulling, pod or seed coat removal, winnowing, sorting, cleaning, grinding, and preheating, as described by Reda *et al*. (2020) and Yusuf *et al*. (2015).

Experimental Animals: Exactly sixteen (16) male Albino rats weighing between 150 and 250g were obtained from Ambrose Alli University, Ekpoma Animal House. These animals were housed in four different sanitised wire mesh cages measuring 30 x 16 x 10 cm with sawdust as bedding. The animals were acclimatised for two weeks in a standard laboratory setting and kept under ambient conditions (12 hours of light and 12 hours of darkness). They were fed with rat pellets of selected standards and water in accordance with the National Institute of Health’s 2002 Public Health Policy on Human Care and Use of Laboratory Animals.

Experimental Design: The rats were randomly categorised into four (4) experimental groups;
Group 1: (Normal Control) Administered 1 ml of distilled water orally using oral gavage for 28 days.
Group 2: Administered 1 ml of melon oil orally using oral gavage for 28 days.
Group 3: Administered 1 ml of palm oil orally using oral gavage for 28 days.
Group 4: Administered 1 ml of Goya olive oil orally using oral gavage for 28 days.
After 28 days of administration, the animals were sacrificed, blood samples were collected in plain containers for antioxidant analysis, and the organs (spleen, liver, kidney, lung, and heart) were harvested and weighed accordingly.

Determination of Antioxidant Activity: Superoxide dismutase (SOD) was determined by the method described by Misra and Fridovich (1972), modified by Idu *et al.* (2016). The catalase (CAT) assay was based on the reaction proposed by Cohen *et al*. (1970). Ellman's technique was used to determine the activity of glutathione reductase (GSH) (Ellman, 1959). Glutathione peroxidase (GPx) was estimated according to the method described by Nyman (1959). Malondialdehyde (MDA) was estimated by the method (Buege and Aust, 1978).

Statistical Analysis: Data were expressed as mean± SEM. Statistical analysis was done using one-way analysis of variance (ANOVA). Values were deemed statistically significant at P<0.05.

RESULTS AND DISCUSSION

Effects of Edible Oils on Serum Antioxidants Concentration of Rats: As shown in Table 1, the effect of melon seed oil, palm oil, and olive oil on SOD concentration revealed no significant change in any of the groups when compared to the control (P > 0.05). Melon seed oil and olive oil significantly increase catalase (CAT) concentration when compared to palm oil and the control groups (**P<0.01; *P<0.05). Several catalase antioxidant enzymes have been linked to being promising in a variety of in vitro and in vivo models of diseases that are connected to oxidative stress. Catalase nullifies the effect of hydrogen peroxides, which are a major factor in oxidative damage caused by the production of excess free radicals. An increased level of catalase showed by *Cucumeropsis mannii* and olive oil shows that both oils have antioxidant properties, which play a major role in fighting free radicals. Catalase, as an anti-oxidant enzyme, may protect the lungs from such damage (Krishnamurthy and Wadhwani, 2012). The effects of melon seed oil; palm oil; olive oil on glutathione peroxidase concentration showed no significant change in glutathione peroxidase concentration in any of the groups when compared to normal control group at P > 0.05. The effect of melon seed oil, palm oil, and olive oil on malondialdehyde (MDA) concentration revealed no significant change in MDA concentration in the normal control, palm oil, and melon oil groups except for the group fed with olive oil (P<0.05). When oxidative stress is high, the malondialdehyde level is frequently used as a gauge of lipid peroxidation. It is therefore consistent with the discovered metabolites acting as antioxidants, primarily able to scavenge these free radicals and thereby averting lipid peroxidation, protein oxidation, and DNA damage (Razack *et al*., 2015; Barrera *et al*., 2008).

Table 1: Serum Antioxidants Concentration of Rats Fed with Different Edible Oils

	SOD (U/mg protein)	CAT (U/mg protein)	GSH(U/mg protein)	GPX(U/mg protein)	MDA(U/mg protein)
Normal Control	0.00022±0.000	0.059±0.027	0.049±0.011	0.021±0.000	6.77±0.335
Palm Oil	0.00022±0.000	0.119±0.006*	0.033±0.005	0.019±0.000	6.53±0.241
Melon Oil	0.00022±0.000	0.164±0.016**	0.038±0.006	0.018±0.001	6.57±0.679
Olive Oil	0.00021±0.000	0.141±0.0206**	0.039±0.001	0.018±0.000	5.86±0.055*

Data are antioxidants concentration of rats feed with palm oil, melon oil and olive oil for 28 days and expressed as means ±SEM (n=4).

The results suggest that melon seed oil possesses the potential to increase the catalase antioxidant system, while olive oil is effective at preventing Lipid peroxidation is frequently the cause of cell damage and breakdown of the cell membrane.

The antioxidant property shown by *Cucumeropsis manni (*melon seed) oil may be a result of the rich bioactive compounds such as tocopherols, squalene, polyphenols, and carotenoids reported by Nwoke *et al.* (2023), which are antioxidants that scavenge free radicals and prevent cellular damage.

Effect of oils on the heart-to-bodyweight ratio: The effect of melon seed oil; palm oil; olive oil on the heart-to-bodyweight ratio is shown in figure 1.

The result showed no significant change in the heart-to-bodyweight ratio in all the groups when compared to the normal control groups (P > 0.05).

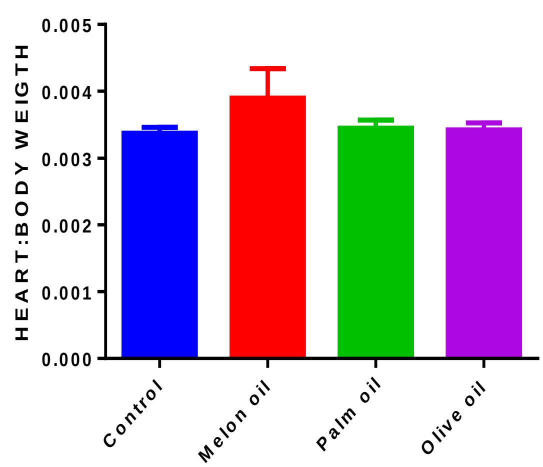

Fig 1: The effect of melon seed oil; palm oil; olive oil on heart to bodyweight ratio. Values are represented as mean ±SEM (n = 4). *(P>0.05) when compared to control group.

Effect of Melon Seed Oil; Palm Oil; Olive Oil on Liver-to-Body Weight Ratio. The effect of melon seed oil, palm oil, and olive oil on liver to bodyweight ratio is shown in Figure 2, from the result, there is no significant change in the liver-to-bodyweight ratio in any of the groups when compared to the control (P > 0.05).

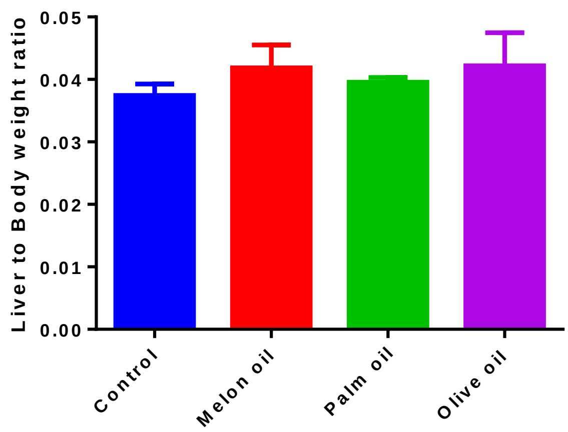

Fig 2: The effect of melon seed oil, palm oil, and olive oil on liver to bodyweight ratio Values are represented as mean ±SEM(n = 4). *P>0.05 when compared to control group.

Effect of melon seed oil, palm oil, and olive oil on spleen to bodyweight ratio: Effect of melon seed oil, palm oil, and olive oil on spleen to bodyweight ratio: As shown in Figure 3, there is no significant change in spleen to bodyweight ratio in any of the groups when compared to the control (P > 0.05).

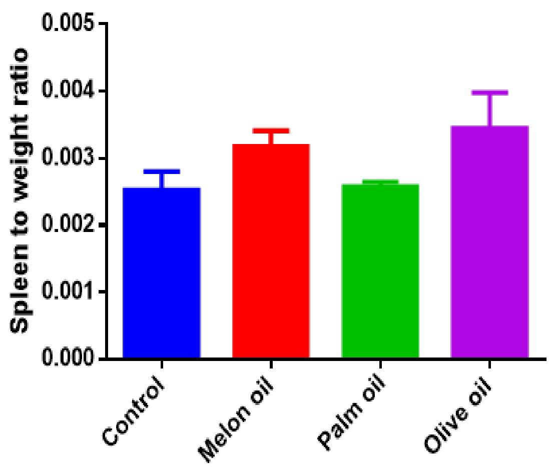

Fig 3: The effect of melon seed oil, palm oil, and olive oil on spleen to bodyweight ratio. There is no significant change in spleen to bodyweight ratio in any of the groups when compared to control (P>0.05). Values are expressed as mean ±S.E.M, (n = 4).

Effect of Melon Seed Oil; Palm Oil; Olive Oil on Kidney to Body Weight Ratio: There is no significant change in kidney to bodyweight ratio in any of the groups when compared to control.

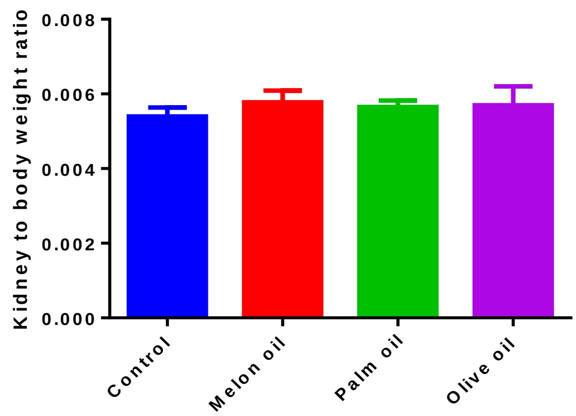

Fig 4: The effect of melon seed oil, palm oil, and olive oil on kidney to bodyweight ratio in any of the groups when compared to control (P>0.05). Values are represented as mean ±S.E.M, (n = 4).

Effect of Melon Seed Oil; Palm Oil; Olive Oil on Lungs to Body Weight Ratio: There is no significant change in lungs to bodyweight ratio in any of the groups when compared to the normal control group.

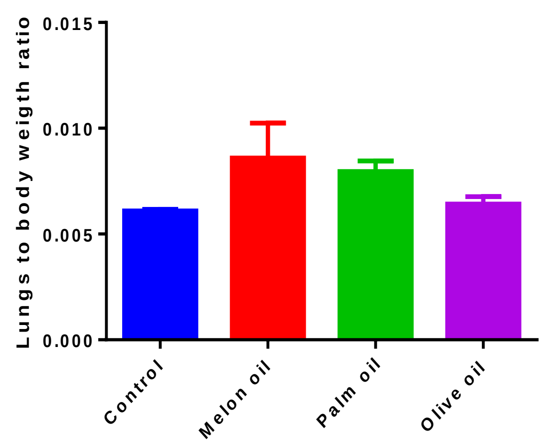

Fig 5: The effect of melon seed oil; palm oil; olive oil on lungs to bodyweight ratio in any of the groups when compared to control at P>0.05. Values are expressed as mean ±S.E.M (n = 4).

According to the results from the organ weight to body ratio, as shown in Figures 1–5, the internal organ to body ratio of rats fed with melon oil, palm oil, and olive oil showed no significant changes. Changes in the weight of an internal organ may be an evidence to show that an organ is abnormal. Since there was no significant change in the organs, it indicates that melon oil consumption poses no risk to body organs. Many diseases have been shown to change the weight of internal organs (Kumar *et al*., 2005).The significance of the organ-to-body weight ratio, often referred to as the organ weight index, lies in its potential to provide insights into the health, development, and functions of specific organs in relation to the overall body, and its interpretation depends on the context and the specific organ being analyzed. In general, organ-to-body ratio is used for health assessment (Mathuramon *et al*., 2009).

Conclusion: The results obtained from the study have shown that melon seed oil has antioxidant properties that can fight free radicals and may protect cells from oxidative damage. Also, the seed oil has no effect on the internal organs of all the experimental rats, indicating that *Cucumeropsis mannii* seed oil would not have any risky potential for the internal organs when consumed.

REFERENCES

Barrera, G; Pizzimenti, S; Dianzani, MU (2008). Lipid peroxidation: Control of cell proliferation cell differentiation and cell death. *Mol. Aspcts. Med. 29(1-2)*:1–8. DOI: 10.1016/j.mam.2007.09.012

Cohen, G; Dembiec, D; Marcus, J (1970). Measurement of Catalase Activity in Tissue Extracts. *Analycal. biochem*, 34: 30-38. DOI: 10.1016/0003-2697(70)90083-7

Dharshini, LCP; Rasmi, RR; Kathirvelan, C; Kumar, KM; Saradhadevi, KM; Akthivel, KM (2023). Regulatory Components of Oxidative Stress and Inflammation and Their Complex Interplay in Carcinogenesis. *Appl. Biochem. Biotechnol*. 195(5):2893-2916. DOI: 10.1007/s12010-022-04266-z

Ellman, GL (1959). Tissue Sulfhydryl Groups. *Arch. Biochem. Biophys.* 82(1):70-77. DOI: 10.1016/0003-9861(59)90090-6

Ezema, BO; Omeje, KO; Ozioko, J N; Fernandez-Castane, A; Eze, SOO (2023). Biodiesel Potential of Cucumeropsis Mannii (White Melon) Seed Oil: A Neglected and Underutilized Resource in Nigeria. *Heliyn.* 9(6).DOI: 10.1016/j.heliyon.2023.e16799

Katerina, K; Berge, GM; Turid, M; Aleksei, K; Grete, B; Trine, Y; Bente, R (2020). Microalgal Schizochytrium Limacinum Biomass Improves Growth and Filet Quality when used Long-term as a Replacement for Fish Oil, in Modern Salmon Diets. *Frontrs. Marn. Sci.* 7, 57. DOI: https://doi.org/10.3389/fmars.2020.00057

Krishnamurthy, P; Wadhwani, A (2012). Antioxidant Enzymes and Human Health. *Antoxidnt. Enzym. 1*, 3-18.

Kumar VA; Fausto, NA, Robbin, C (2005). *Pathological Basis of Disease.* 7th. Philadelphia,Pennsylvania: Elsevier Saunders.

Lillehoj, HS; Lee, KW (2012). Immune Modulation of Innate Immunity as Alternatives-to-Antibiotics Strategies to Mitigate the use of Drugs in Poultry Production. *Poltr. Sci. 91*(6): 1286-1291. DOI: https://doi.org/10.3382/ps.2011-01948

Mamta, MK; Dhillon, G S; Brar, SK; Verma, M (2014). Antioxidants. *Biotrnsform. Wste. Biomss. into High Value Biochemicals*, 117-138.

Mathuramon P; Chirachariyavej T; Peonim, AV; Rochanawutanon, M (2009). Correlation of Internal Organ Weight with Body Weight and Length in Normal Thai Adults. *J. Med. Assoc. Thai.* 92(2):250–258.

Misra, H; Fridovich, I (1972). The Role of Superoxide Anion in the Autooxidation of Epinephrine and a Simple Assay for Superoxide dismutase. *J. Biol. Chem.* 25; 247(10)3170-3175.

Nyman, M. (1959). Serum hatoglobin; methodological and clinical studies. *Scand. J. Clin. Lab.Invest.* 11, 1-169.

Razack, S; Kumar, KH; Nallamuthu, I; Naika, M; Khanum, F (2015). Antioxidant, Biomolecule Oxidation Protective Activities of *Nardostachys jatamansi* DC and Its Phytochemical Analysis by RP-HPLC and GC-MS. *Antioxi.* 4, 185-203. DOI: 10.3390/antiox4010185

Reda, M; El-Sayed, A; Almutairi, A; Hassoub; A (2020). Fatty acid Profiles and Fuel Properties of Oils from Castor Oil Plants Irrigated by Microalga-Treated Wastewater. *Egypt. J. Bot.* 60(3), 797-804. DOI: 10.21608/EJBO.2020.22970.1444

Sabikhi, L; Kumar, MS (2012). Fatty Acid Profile of Unconventional Oil Seeds. *Adv Food Nutr Res.* 67, 141-184. DOI: 10.1016/B978-0-12-394598-3.00004-6

Wang, F; Li, H; Zhao, H; Zhang, Y; Qiu, P; Li, J; Wang, S (2018). Antidiabetic Activity and

Chemical Composition of Sanbai Melon Seed Oil. *Evid.Based Complem. Alternat. Med.* DOI: https://doi.org/10.1155/2018/5434156.

Yang, C F J; Duro, D; Zurakowski, D; Lee, M; Jaksic, T; Duggan, C (2011). High Prevalence of Multiple Micronutrient Deficiencies in Children with Intestinal Failure: A Longitudinal Study. *J. ped.* 159(1), 39-44. https://doi.org/10.1016/j.jpeds.2010.12.049.

Ying, Z; Wei, WZ; Yong, L; Baohong, Z; Dangquan, Z (2020).Edible Plant Oil. *Front. Plat. Sci*.11: 1315. DOI: 10.3389/fpls.2020.01315

Yusuf, AK; Mamza, PAP; Ahmed, AS; Agunwa, U (2015). Extraction and Characterization of Castor Seed Oil from Wild *Ricinus communis* L. *Intern. J. Sci. Environ. Technol.*, 4(5): 1392-1404.