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# Different Effects of *Hylocecarus Polyrhizus* and *Hylocecarus Undatus* Extract on Reducing Total Cholesterol of Male *Rattus Norvegicus* Wistar Strain

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**Abstract**

*A chronic ailment that is caused by excessive food consumption and a lack of physical activity, obesity is a condition that may be prevented. The tropical dragon fruit can control cholesterol levels, support the immune system, and give a natural colorant for culinary applications. In a true experimental research, sample with rats were fed red and white dragon fruit extracts to determine the amounts of cholesterol in their bodies. Spectrophotometry was used to determine the rats' blood lipid profiles, cholesterol levels, and body weight after they were fed a meal that was high in fat and contained duck egg yolk. For this study, extracts from red and white dragon fruits were administered to male Wistar rats to determine their effects on cholesterol levels. After fourteen days, both groups had a reduction in high cholesterol levels, with group 4 exhibiting the most significant drop in cholesterol levels. Additionally, the extracts decreased the levels of MDA while simultaneously increasing the levels of SOD. The most significant rise was seen in group 4, given white dragon fruit extract at 140 mg/200 gr BW daily. SPSS was utilized to analyze the effects of dragon fruit on blood cholesterol levels in experimental animals, employing the LSD technique and one-way ANOVA.*

## Introduction

Obesity and overweight, the result of excessive food consumption and lack of physical activity, are increasingly recognized as chronic disorders that contribute significantly to the worldwide rise in these types of illnesses. Obesity and overweight people face psychological and social stigmas that make them more likely to experience low self-esteem, sadness, and discrimination in their personal and professional lives (Rubino et al., 2020). Lost worker productivity, increased disability, and early mortality are additional economic costs that arise from the physical and psychological consequences of obesity. These consequences account for significant healthcare expenditures (Purnell, 2018).

The prevalence of overweight and obesity has been rising over the last several decades, affecting people of all ages. Statistics show a dramatic rise in incidence in recent years, particularly among adults (from 28.9 percent in 2013 to 35.4 percent in 2018). The prevalence of overweight and obesity is higher among adult women; in 2018, 44.4% of women and 26.6% of men were afflicted (UNICEF Indonesia, 2019). Obesity is associated with several fatal conditions, making this occurrence noteworthy. The increased mortality from non-communicable illnesses, such as atherosclerotic cardiovascular disease, type 2 diabetes, and certain cancers, causes a ±20-year decrease in life expectancy, which is a result of obesity. Clinical practice often uses the body mass index (BMI), which is the ratio of a person's weight in kilograms divided by their height in square meters (kg/m2), to evaluate obesity, which is conventionally described as an excess of body fat that leads to health concerns. Several large-

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scale population studies show that a Body Mass Index (BMI) greater than 30 kg/m2 has been linked to an elevated risk of mortality and morbidity since its inception. Despite its limitations, body mass index has become a popular therapeutic tool for risk stratification and tracking adiposity changes in individuals and populations (Piché et al., 2020).

Heart conditions such as coronary heart disease (CHD), heart failure (HF), hypertension, Cerebrovascular Disease (CVD), Atrial Fibrillation (AF), ventricular arrhythmias, and sudden cardiac arrest have been associated with obesity according to a large body of clinical and epidemiological research (Koliaki et al., 2019). Low-density lipoprotein (LDL), non-high-density lipoprotein (HDL), and total cholesterol (TC) are the most common lipid measures linked to cholesterol-related hazards (Quispe et al., 2020).

Cholesterol, triglycerides, phospholipids, and proteins comprise lipids circulating in the blood as lipoproteins. In blood, you may find five primary lipoproteins: first, chylomicrons; second, very-low-density lipoprotein; third, intermediate-density lipoprotein; fourth, low-density lipoprotein; and fifth, high-density lipoprotein— (Lee & Siddiqui, 2019). Here are the five primary lipoproteins: Very Low-Density Lipoprotein (VLDL), chylomicrons, Low-Density Lipoprotein (LDL), Intermediate-Density Lipoprotein (IDL), and high-density lipoprotein (HDL). These lipoproteins transport the hydrophobic lipids, phospholipids, triglycerides, and cholesterol in the extracellular and plasma fluids. Cellular life relies on lipids, proteins, carbs, and nucleic acids. Various cellular processes rely on lipids, including membrane synthesis, energy storage, intracellular signaling, and the transfer of vitamins and other vital organic compounds. Lipoproteins make the body's systemic circulation's hydrophilic environment possible, allowing the transfer of hydrophobic lipids (Casso & Farzam, 2022).

Because of their insolubility in water, lipids are carried throughout the body by proteins called lipoproteins. Transporting many dietary fatty acids as triglycerides to prevent toxicity is necessary. Critical lipid transport processes include negligible intestine absorption and transfer, liver-to-peripheral tissue transport, and gut-to-liver and peripheral tissue transport. These processes are facilitated by these lipoproteins (reverse cholesterol transport). An additional role is the removal of harmful foreign hydrophobic and amphipathic substances, such as bacterial endotoxins, from infected and invaded regions (Kenneth & Feingold, 2021).

One of the pathological changes noted in obesity is excessive ROS and oxidative stress (Naomi et al., 2023). Oxidative stress occurs when, in tissues and organs, the formation of highly reactive molecules, such as ROS, exceeds the capacity of the endogenous antioxidant defense system, causing cell damage and dysfunction resulting in a wide range of diseases. If the body's antioxidant defense system fails to neutralize excess free radicals, the imbalance between oxidants and the defense system can lead to pathological conditions (Vona et al., 2021).

Malondialdehyde (MDA) production levels are a good indicator of oxidative stress. When membrane phospholipids degrade within cells, polyunsaturated fatty acids are produced as a secondary by-product of cellular lipid peroxidation known as Malondialdehyde (MDA). Elevated serum malondialdehyde levels, indicative of elevated free radical generation, can result from an overburdening of the antioxidant defense system, which can cause cell death and pathogenic processes (Cherian et al., 2019). Eating foods rich in antioxidants is one way to manage cholesterol levels, essential for healthy health. By eliminating reactive oxygen species, antioxidants in the diet help preserve human cell membranes from oxidation, also known as lipid peroxidation.

Superoxide dismutase is an enzymatic antioxidant that helps the body fight reactive species; there are other non-enzymatic antioxidants (SOD). One example of an endogenous antioxidant system is the network of enzymes with a primary and secondary defensive role. One of the main defenses against reactive species is Superoxide Dismutase (SOD). The antioxidant enzyme Superoxide Dismutase (SOD) plays a crucial role in protecting cells from oxidative stress. Reactive oxygen species mediate many diseases, and this enzyme effectively treats them (Younus, 2018). Several phenolics, ascorbate, carotenoids, and flavonoids are non-enzymatic antioxidants that mitigate oxidative damage (Y.A. Barku, 2019). Fruits, vegetables, nuts, and supplements are examples of whole-plant foods that contain antioxidants (Bergin et al., 2021). Dragon fruit is one item that contains antioxidants that are not enzymatic (Wijitra Liaotrakoon, 2013).

Hylocereus polyrhizus, also known as dragon fruit, is native to arid tropical regions. Vitamin C, flavonoid chemicals, and polyphenols are a few antioxidants in this dragon fruit. The anthocyanins that give dragon fruit (Hylocereus polyrhizus) its vibrant red hue also serve as powerful antioxidants (Kristanto, 2014). Pectin, an edible kind of fiber, and bioactive compounds, including ascorbic acid, provitamin A, and red pigment, are some of the health benefits of dragon fruit. Vitamins B1, B2, B3, and C are among the many minerals found in red pitaya fruit. Other nutrients include iron, calcium, phosphorus, and vitamin C. One of dragon fruit's several uses is to strengthen the immune system. The pitaya fruit is intriguing and possesses a fruit color that may be utilized as a natural culinary colorant. The community should develop additional pitaya fruit food variant items (Arsyad & Riska, 2021).

A variety of dragon fruits, including those with red meat (*Hylocereus Polyhisus*), yellow skin (*Hylocereus undatus), and white flesh (Hylocereus undatus*), have been cultivated extensively (*Hylocereus Megulanthus*). The plant *Hylocereus Undatus*, which produces dragon fruit with white flesh, is rich in minerals and flavonoids. You may find dragon fruit trees in tropical and subtropical regions most of the year. Many people want dragon fruit because it looks so exotic. Many little black seeds are inside the flesh, which is delicious. Antioxidants and micronutrients may also be found in this (Wijitra Liaotrakoon, 2013).

## Methods

This true experiment used a pre-and post-test control group design (Notoatmodjo, 2022). To examine the impact of red and white dragon fruit extracts on cholesterol levels in male Wistar rats. We established the sample size using the Ferderer formula, and the rats we used had human-like physiological and behavioral characteristics (Wolfensohn & Lloyd, 2013). Attributes that differ between individuals or organizations are known as variables (Suwarno & Nugroho, 2023). The administration of red dragon fruit extract is the independent variable, while the levels of lipids, malondialdehyde, and superoxide dismutase (SOD) in rats are the dependent variables. Methods for macerating fresh red dragon fruit were used to extract red and white dragon fruit extracts, according to the operational definition. Wistar rats were given a high-fat diet of duck egg yolk to elevate cholesterol levels. Every day, the weight of rats of the *Rattus Novergicus* wistar strain was recorded, and lipid profiles, MDA, and SOD levels were investigated with the use of a lipid profile analyzer and the TBARs technique. Research procedures: Male Wistar strains were acclimatized to the new habitat and food for seven days at the Animal House, University of North Sumatra. Mincing, drying in an oven, macerating in a solvent, filtering, and vaporizing fresh red and white dragon fruit flesh yielded a crude extract that was then suspended. Dragon fruit extracts are tested for illness treatment using phytochemicals to discover tannins, flavonoids, alkaloids, terpenoids, steroids, and saponins. After 14 days of high-fat meal induction and dragon fruit administration, rats' blood lipid profiles, cholesterol levels, and body weight were measured using spectrophotometry (Kayamori et al., 1999). The highest dose was 120 mg/200grBW/day for red and white dragon fruit, modified by 20mg/dose (Witosari & Widyastuti, 2014). TBARs assessed Malondialdehyde (MDA) by reacting blood plasma with 20% TCA, 1% TBA, and 50% glacial acetic acid and plotting absorbance data into the MDA formula. ELISA and spectrophotometry measured SOD levels (Rusip et al., 2022).

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This study utilized various tools and materials to analyze the effects of dragon fruit on blood cholesterol levels in experimental animals. Data was analyzed using SPSS (Ghozali, 2018), Kolmogorov-Smirnov test, one-way ANOVA, and Post Hoc Test with LSD technique. The study also included food and drinks for experimental animals.

## Result and Discussion

### Measurement Results

Table 1. Data Body Average Weight Before and After High-Fat Diet

| Group | Body Weight (gr) | | Naso-anal Length (mm) | | Lee index | |
|---|---|---|---|---|---|---|
| | Before | After | Before | After | Before | After |
| Negative Control | 221 | 232 | 212 | 213 | 0.27 | 0.34 |
| Positive Control | 229 | 311 | 214 | 213 | 0.28 | 0.33 |
| Treatment P1 | 232 | 318 | 213 | 214 | 0.28 | 0.31 |
| Treatment P2 | 228 | 314 | 214 | 216 | 0.28 | 0.31 |
| Treatment P3 | 225 | 316 | 217 | 218 | 0.27 | 0.32 |
| Treatment P4 | 227 | 315 | 216 | 214 | 0.26 | 0.33 |

Rats were weighed before and after a high-fat diet to determine if it increased cholesterol levels and obesity. The average Lee index was 0.27 before the diet but increased to 0.32 after 14 days of quail egg yolk consumption. This suggests that rats were obese before the diet, and red and white dragon fruit extracts may help reduce obesity. The study found that a high-fat diet induced rats with high cholesterol levels. After 14 days of a high-fat diet, the cholesterol levels increased. However, the cholesterol levels decreased after red and white dragon fruit extract treatment. The negative control group had an average cholesterol level of 37.27 mg/dl, while the positive control group had an average cholesterol level of 65.60 g/dl. Adhering red dragon fruit extract at 80mg/200grBW/day doses and 140mg/200grBW/day significantly decreased cholesterol levels.

Table 1.2 Total Result Cholesterol Levels and MDA Level

| No. | Group | Repetition | Cholesterol Level after | | MDA Level after | |
|---|---|---|---|---|---|---|
| | | | high-fat diet (mg/dl) | treatment (mg/dl) | high-fat diet (mg/dl) | treatment (mg/dl) |
| 1 | Negative Control | 1 | 37.5 | 37.9 | 0,76 | 0,54 |
| 2 | | 2 | 38.2 | 38.5 | 0,69 | 0,45 |
| 3 | | 3 | 36.2 | 36.7 | 0,72 | 0,48 |
| 4 | | 4 | 37.2 | 37.6 | 0,75 | 0,67 |
| | Average | | **37.27** | **37.67** | **0.73** | **0.53** |
| 5 | Positive Control | 5 | 68.1 | 68.0 | 0,12 | 0,10 |
| 6 | | 6 | 59.1 | 59.0 | 0,10 | 0,10 |
| 7 | | 7 | 68.3 | 68.2 | 0,14 | 0,13 |
| 8 | | 8 | 67.5 | 67.2 | 0,13 | 0,14 |
| | Average | | **65.82** | **65.60** | **0.12** | **0.11** |
| 9 | Treatment 1 | 9 | 68.1 | 58.2 | 0,24 | 0,10 |
| 10 | | 10 | 69.5 | 59.1 | 0,21 | 0,12 |
| 11 | | 11 | 67.7 | 57.5 | 0,19 | 0,09 |
| 12 | | 12 | 68.3 | 58.7 | 0,23 | 0,11 |
| | Average | | **68.40** | **58.37** | **0.21** | **0.10** |
| 13 | Treatment 2 | 13 | 69.2 | 57.9 | 0,18 | 0,08 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | | 14 | 66.9 | 59.5 | 0,24 | 0,12 |
| 15 | | 15 | 69.1 | 50.1 | 0,25 | 0,10 |
| 16 | | 16 | 67.3 | 49.2 | 0,28 | 0,11 |
| | Average | | **68,12** | **54.17** | **0.23** | **0.10** |
| 17 | Treatment 3 | 17 | 68.1 | 51.2 | 0,16 | 0,09 |
| 18 | | 18 | 68.4 | 48.9 | 0,17 | 0.10 |
| 19 | | 19 | 69.3 | 39.8 | 0,18 | 0,06 |
| 20 | | 20 | 67.2 | 40.1 | 0,19 | 0,05 |
| | Average | | **68.25** | **45** | **0.17** | **0.07** |
| 21 | Treatment 4 | 21 | 69.4 | 37.4 | 0,15 | 0,05 |
| 22 | | 22 | 68.3 | 36.3 | 0,18 | 0,04 |
| 23 | | 23 | 70.1 | 38.6 | 0,14 | 0,05 |
| 24 | | 24 | 68.2 | 38.1 | 0,17 | 0,07 |
| | Average | | **69** | **37.6** | **0.16** | **0.05** |

Note:

**Negative Control:** (Rat pellet feed + Na CMC/day/head)

**Positive Control** (Mouse pellet feed + Duck egg + Simvastatin)

**Treatment 1:** (Rat pellet feed + Duck Eggs + Red Dragon Fruit Extract at a dose of 80mg 200gr BW/day)

**Treatment 2:** (Rat pellet feed + Duck Eggs + White Dragon Fruit Extract at a dose of 80mg/200grBW/day)

**Treatment 3:** (Mouse pellet feed + Duck Egg +Red Dragon Fruit Extract at a dose of 140mg/200grBW/day)

**Treatment 4:** (14-day rat pellet feed + Duck Egg + White Dragon Fruit Extract at a dose of 140mg/200grBW/day).

The study examined the effects of red and white dragon fruit extracts on cholesterol levels in rats. After 14 days of a high-fat and high-cholesterol diet, the MDA levels were re-examined. Results showed a decrease in cholesterol levels in each group. The negative control group had an average MDA level of 0.73 nmol/ml, while the positive control group had an average of 0.12 nmol/ml. Treatment groups 1, 2, and 4 showed similar decreases. The white dragon fruit extract at a dose of 140 mg/200grBW showed a significant decrease in MDA levels, while the red dragon fruit extract at a dose of 140 mg/200grBW showed a decrease of 0.10 nmol/ml.

Table 3. Data On the Average Increase in SOD (Superoxide Dismutase) Levels

| **Variables** | **SOD levels** | **Kolmogorov Smirnov** | **Levene Test** |
|---|---|---|---|
| Negative Control | 3.324 | 0.978 | 0.876 |
| Positive Control | 3.108 | 0.890 | 0.786 |
| Treatment 1 | 3.189 | 0.867 | 0.750 |
| Treatment 2 | 3.246 | 0.845 | 0.850 |
| Treatment 3 | 3.348 | 0.899 | 0.895 |
| Treatment 4 | 3.356 | 0.899 | 0.895 |

Superoxide dismutase (SOD) levels were increased in a study involving red dragon fruit extract and white dragon fruit extract. The results showed an average increase in cholesterol levels in each group. White dragon fruit extract at a dose of 140 mg/200grBW showed the most significant increase in SOD levels, 3,356 nmol/ml. The data was tested for normality and homogeneity, with results showing no significant differences in all treatments. The study concluded that the SOD levels were homogeneous and could be used for a One-Way ANOVA parametric test.

**Data Analysis Cholesterol and MDA Level Results**

Table 4. Data Normality Test Results

| Treatment | Groups | Cholesterol Level | | | MDA Level | | |
|---|---|---|---|---|---|---|---|
| | | Kolmogorov-Smirnov[a] | | | Kolmogorov-Smirnov[a] | | |
| | | Statistic | Df | Sig. | Statistic | Df | Sig. |
| Before | (-) control | .214 | 4 | .200 | .912 | 4 | .491 |
| | (+) control | .403 | 4 | .200 | .827 | 4 | .161 |
| | Treatment 1 | .301 | 4 | .200 | .993 | 4 | .972 |
| | Treatment 2 | .293 | 4 | .200 | .971 | 4 | .850 |
| | Treatment 3 | .181 | 4 | .200 | .911 | 4 | .488 |
| | Treatment 4 | .278 | 4 | 200 | .895 | 4 | .406 |
| | (-) control | .210 | 4 | .200. | .940 | 4 | .653 |
| | (+) control | .391 | 4 | .200. | .971 | 4 | .850 |
| | Treatment 1 | .181 | 4 | .200. | .963 | 4 | .798 |
| | Treatment 2 | .280 | 4 | .200. | .939 | 4 | .650 |
| | Treatment 3 | .297 | 4 | .200. | .993 | 4 | .972 |
| | Treatment 4 | .192 | 4 | .200. | .950 | 4 | .714 |

Based on the results of the normality test, data on total cholesterol and MDA levels in the control and treatment groups both before and after treatment showed normal distribution with a p-value> 0.05.

Table 5. Data Homogeneity Test Results

| Groups Treatment | Cholesterol Level | | | | MDA Level | | | |
|---|---|---|---|---|---|---|---|---|
| | Levene Statistic | df1 | df2 | Sig. | Levene Statistic | df1 | df2 | Sig. |
| Before | 4.835 | 5 | 18 | .350 | 4.109 | 5 | 18 | .061 |
| After | 15.079 | 5 | 18 | 2.373 | 1.218 | 5 | 18 | .341 |

The significance values in the column are more significant than 0.05, indicating that the negative control, positive control, and treatment groups are homogeneous or have the same variance.

Table 6. One-Way ANOVA Test Results

| Levels Result | Groups | | Sum of Squares | Df | Mean Squares | F | Sig. |
|---|---|---|---|---|---|---|---|
| Cholesterol Level | Before | Between Groups | 3152.345 | 5 | 630.469 | 157.148 | .000 |
| | | Within Groups | 72.215 | 18 | 4.012 | | |
| | | Total | 3224.560 | 23 | | | |
| | After | Between Groups | 2644.734 | 5 | 528.947 | 37.629 | .000 |
| | | Within Groups | 253.023 | 18 | 14.057 | | |
| | | Total | 2897.756 | 23 | | | |
| MDA Level | Before | Between Groups | .670 | 5 | .134 | 72.343 | .000 |
| | | Within Groups | .033 | 18 | .002 | | |
| | | Total | .703 | 23 | | | |
| | After | Between Groups | 1.033 | 5 | .207 | 306.657 | .000 |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Within Groups | .012 | 18 | .001 | | |
| | | Total | 1.045 | 23 | | | |

The research data passes normality and homogeneity tests, showing normal distribution and homogeneous variances. A One-way ANOVA test reveals a significant difference between the control and treatment groups. Post-hoc LSD tests show average differences in Cholesterol and MDA levels, indicating significant differences from other groups. The results indicate a significant difference between the groups.

**Data Analysis Phytochemical Results**

The first phytochemical test evaluates the tannin content of dragon fruit extracts, which contain polyphenols with physiological effects like lipid reduction and weight loss in obese mice (Kamarudin et al., 2021). Researchers found froth in dragon fruit extracts, indicating the presence of saponins, biologically active phytochemicals that help reduce body weight and serum lipid levels (Marrelli et al., 2016). The flavonoid test, which involves heating red and white dragon fruit extracts in concentrated HCl, shows positive results for flavonoids, anticancer properties, and antioxidants (Ullah et al., 2020). The alkaloid content of white dragon fruit and dragon fruit extract was examined in the study. Both the red and white dragon fruits failed the alkaloid test. The steroid test analyzes dragon fruit extracts, adding ethyl acetate, acetic acid hydrate, and sulfuric acid, revealing positive terpenoids, green steroids, and red triterpenoids in Asian medicine. Phytochemical tests reveal that red and white dragon fruit extracts contain secondary metabolite compounds like tannins, saponins, flavonoids, and triterpenoids, which help lower cholesterol in white rats. The study investigated the effect of red and white dragon fruit extracts on cholesterol levels in male Wistar rats. The study used 24 Wistar white rats and six groups of rats, each with up to four heads. Rat pellets, duck eggs, and 80 mg/200 gr/kg red dragon fruit extract were administered daily to the first treatment group, and 140 mg/200 gr/kg white dragon fruit extract per day to the second and third treatment groups. The mice were given a high-cholesterol, high-fat diet every day. A quail's egg yolk was provided as nourishment. Cholesterol levels are elevated exogenously by this meal. Red dragon fruit (H*ylocecarus polarizes)* and white dragon fruit (*Dracocephalus niruri*) extracts were administered after a 14-day high-fat, high-cholesterol diet (Hylocecarus updates). Body weight, as measured by the Lee index, was utilized to validate the mice's obesity.

The human body produces cholesterol, a hydrophobic molecule, via a de novo process involving extrahepatic tissues and the liver (Harvey & Ferrier, 2017). Cholesterol ensures that cells usually operate by performing a variety of functions. Vitamin D, steroid hormones (such as cortisol, aldosterone, and adrenal androgens), and sex hormones begin with cholesterol as a precursor (e.g., testosterone, estrogen, and progesterone). The typical range for blood cholesterol in white Wistar rats (*Rattus norvegicus*) is 10-54 mg/dl (Smith & Mangkoewidjojo, 1988). It is deemed elevated when cholesterol levels are above 54 mg/dl. The cholesterol levels in the treatment group of rats fed a high-fat diet are higher than 54 mg/dl, as shown in the table above. Following a 14-day course of treatment with either red or white dragon fruit extract (*Hylocecarus polyrhizus* or *Hylocecarus undatus*), researchers re-evaluated the animals' cholesterol levels. The cholesterol levels in each group are decreasing in the table above. The average cholesterol level in the negative control group increased from 37.27 mg/dl to 37.67 mg/dl after 14 days. Since the control group does not consume a high-fat diet, their total cholesterol levels are normal. After starting at 65.82 mg/dl, it dropped to 65.60 g/dl in the positive control group. Despite a decline, the positive control group's cholesterol levels remained high. The study found that red and white dragon fruit extract treatment groups experienced declining high cholesterol levels. The third group, which took 140 mg/200 grBW daily of red dragon fruit extract, also saw a drop. The most significant reduction was observed in group 4, which received 140 mg/200 grBW/day of white dragon fruit extract. The researchers re-examined the MDA levels of each test animal after 14 days of treatment with red dragon fruit extract therapy (*Hylocecarus polyrhizus)* and white dragon fruit extract (*Hylocecarus undatus*). The cholesterol levels in each group are decreasing in the table above. The average MDA level in the negative control group was 0.73 nmol/ml at the beginning of the experiment and decreased to 0.53 nmol/ml after 14 days. Since the negative control group did not consume a high-fat diet, their MDA levels were within the normal range. The starting point of 0.12 nmol/ml dropped to 0.11 nmol/ml in the positive control portion. Despite a decline, the positive control group's MDA levels remained high. The study found that administering red and white dragon fruit extracts significantly reduced MDA levels. In treatment group 1, red dragon fruit extract concentration decreased from 0.21 nmol/ml to 0.10 nmol/ml. In treatment group 2, the concentration dropped from 0.23 nmol/ml to 0.10 nmol/ml. The most significant reduction occurred in treatment group 4, with a daily dose of 140 mg/200 gr/BW of white dragon fruit extract. Study participants' SOD levels were re-evaluated after 14 days of treatment with red and white dragon fruit extracts, respectively, administered by *Hylocecarus polarizes* and *Hylocecarus* updates. The study found that the group receiving 140 mg/200 grBW of white dragon fruit extract had the highest increase in SOD levels (3,356 nmol/ml), followed by the group receiving 140 mg/200 grBW of red dragon fruit extract (3.348 nmol/ml), 80 mg/200 grBW of white dragon fruit extract (3.246 nmol/ml), and the negative and positive control groups. Red dragon fruit extract increased SOD levels more than white dragon fruit extract.

## Conclusion

The study involving Wistar male rats found that red and white dragon fruit extracts effectively reduced cholesterol levels. When administered the red and white dragon fruit extracts, the rats were already overweight. The average Lee index value in each treatment group was 0.27 before the high-fat diet, which was not included in the obese condition. After 14 days of eating a high-fat diet of quail egg yolk, the mean change in the Lee index for the control group was 0.32. Total cholesterol testing showed that all groups exhibited a decrease in cholesterol levels. The average cholesterol level in the negative control group increased from 37.27 mg/dl to 37.67 mg/dl after 14 days. The positive control group's cholesterol levels remained high. The red dragon fruit extract (80 mg/200 gr/kg BW/day) and white dragon fruit extract (80 mg/200 gr/kg BW/day) groups saw a decline in blood levels. The MDA level tests demonstrated that the cholesterol levels in all treatment groups had decreased. The average MDA level in the negative control group decreased from 0.73 nmol/ml to 0.53 nmol/ml after 14 days. The SOD test data revealed that the groups that received white dragon fruit extract at a dose of 140 mg/200 grBW/day had the highest increase in SOD levels.

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