# The Influence of Plum (*Prunus salicina Lindl*) Extract to Liver MDA Levels in Rats Induced by High Fat Diet

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**Abstract.** This observation was performed to evaluate the effect of Plum extract on liver damage with indicators of MDA levels in male rats. The goal of this study was to obtain the benefits of herbal elements such as hepatoprotection in rats induced by an excessive-fat diet. A high-fat diet is expected to produce a state of fatty liver with the aid of increasing the liver MDA. This study is a laboratory observation with a very randomized design, the use of 25 samples which had been grouped into five organizations which includes five rats, which are a negative group, a positive group, and three treatment groups who were given ethanol extract of plum dose of 0,8 mg/kg BW/day, 1,6 mg/kg BW/day and 2,4 mg/kg BW/day. The negative group was only given standard pellets while the positive group were given a high-fat diet and induced by propylthiouracil. The indicator that will be assessed is the liver MDA. The data obtained were analyzed using analysis of variance (ANOVA) and further tests were carried out with Duncan's test. The consequences confirmed that the liver MDA levels in the group given Plum fruit extract at doses of 0.8 mg/kg BW and 1.6 mg/kg BW were significantly lower than the positive control group. Plum fruit extract was able to inhibit the increase in liver MDA levels at an effective dose of 0.8 mg/kg BW.

**Keywords:** High fat diet · Liver MDA · Plum

## 1 Introduction

Consumption of high-fat foods has become a lifestyle in modern times like this. According to Riskesdas data in 2018, 41.7% of Indonesian people have a habit of consuming fatty foods such as fried foods 1 time a day. This number is quite large and if the condition is left unchecked, it can certainly become a risk factor for dangerous diseases, for example, cardiovascular disease, obesity, metabolic syndrome and non-alcoholic fatty liver. Nonalcoholic Fatty Liver Disease (NAFLD) is a prime purpose of liver disease morbidity and mortality. The superiority of NAFLD increases with the increase in weight


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problems. The information shows that fatty liver happens in 10–15% of normal individual and 70–80% of obese people. Approximately 3% of ordinary people and 15–20% of obese people (BMI more than 35 kg/m2) have steatohepatitis [1–3].

Fat accumulation in the liver is the preliminary degree of the prevalence of NAFLD. The significant accumulation of triglycerides causes an imbalance between the influx and synthesis of free fatty acids inside the liver, the system of oxidation, and shipping out of cells arising from diverse causative factors. The subsequent stage is hepatic steatosis which leads to the injury and inflammation of liver cells and ends with scar formation or fibrosis [4, 5].

The management of NAFLD requires long-term monitoring. Supportive remedy is accomplished with weight loss for obese people and life-style modification. Pharmacological therapy is only given to those who have not experienced improvement by making lifestyle changes, and the effects are not always excellent. Numerous studies have been carried out to find the most effective therapy in the treatment of NAFLD, including the potential of natural ingredients that act to prevent liver disease. Efforts to prevent liver disease are mostly carried out by utilizing various natural ingredients such as Curcuma, manganese skin, red fruit and pomegranate. One of the natural ingredients that are also thought to be able used in alternative medicine is plums, which have been shown to have a hyperlipidemic effect in rats [6–8].

Plums are healthy fruits for consumption because they contain many important nutrients, such as carbohydrates, vitamins, and minerals. Plums are known to have a high source of antioxidants compared to other fruits, such as apples, tomatoes, strawberries, and blueberries4. The fat content in plums is also low, so it is very safe for consumption. Plums are known as a drug that has many properties such as antidiabetic, antiobesity, treating cardiovascular disease, overcoming fever, and many more.

According to the phytochemical analysis test results, plums (*Prunus salicina Lindl*) contain anthocyanins, quercetin, and carotenoids6. Quercetin is part of a flavonoid7 compound that has been shown to reduce triglyceride levels which can prevent liver damage. Research on plums is currently still very minimal, but there is research on plums on bone density using a dose of 1.6 g/kg BW. This dose became the basis for use in researching the effects of plums on various parameters of liver function in rats fed a high-fat diet [9, 10].

## 2 Material and Methods

Research is experimentally laboratory with comparative techniques. The study used 25 male rats of Wistar strains that were adapted for seven days. The group consisted of 5 mice. K1 (n = 5), the negative control group, given only standard feeding, K2 was the positive control group given by high-fat diet and PTU 5,4 mg/200gr BW for 14 days, K3 to K4 was the treatment group given Plum extract with a dose of 0,8 mg/Kg BW for K3, 1,6 mg/Kg BW for K4, and 2,4 mg/Kg BW for K5. This study has acquired ethical approval from the Padjadjaran University Bandung Indonesia Ethics Committee. The Plum extract is administered orally for 14 days after being induced by a high-fat diet, then measured the liver MDA levels. The data were analyzed using One Way ANOVA and continued with Duncan's post hoc test.

**Table 1.** Description of liver MDA levels

| Groups | Average Femur Length | P value |
|---|---|---|
| K1: Negative control group | 0,097 ± 0,006 | 0,002 |
| K2: Positive control group | 0,145 ± 0,031 | |
| K3: Treatment group dosage 0,8 mg/kg BW | 0,107 ± 0,006 | |
| K4: Treatment group dosage 1,6 mg/kg BW | 0,111 ± 0,017 | |
| K5: Treatment group dosage 2,4 mg/kg BW | 0,133 ± 0,013 | |

## 3 Results and Discussion

Research on the influence of Plum extract has been conducted within the animal laboratory of Padjajaran University, from September 2021 to November 2021, in five rat groups, every of which consists of 5 rats that met the exclusion and inclusion criteria. Outcomes of liver MDA measurements show a difference between the treatment group and the control group, as in Table 1.

There are differences in liver MDA levels between the control and treatment groups. In the negative control group (K1), the MDA levels were the lowest, while K2 group, positive control induced by a high-fat diet, showed the highest results. When compared between treatment groups, liver MDA levels increased with increasing doses of ethanol extract of plum. However, the value was still smaller than liver MDA levels in positive controls (Table 1). The administration of ethanol extract of plum can increase liver MDA levels along with the increase in the dose. The one way Anova test results p-value = 0.002 ($p \leq 0.05$), which means that there are significant differences in liver MDA levels between the treatment groups.

The Post Hoc test for liver MDA level variables showed that the group was divided into 3 subsets. The 1$^{st}$ subset consisted of a negative control group, a group that was given a high-fat diet and Plum extract at a dose of 0,8 mg/Kg BW and a dose of 1,6 mg/Kg BW. The 2$^{nd}$ subset consisted of a group that was given a high-fat diet and Plum extract at a dose of 1,6 mg/Kg BW and a dose of 2,4 mg/Kg BW. The 3$^{rd}$ subset consisted of the positive ontrol group who were only given a high-fat diet (Table 2) and the treatment group which was given 2,4 mg/Kg BW Plum extract. This indicates that the administration of a fat diet resulted in the highest liver MDA levels, which was significantly different from the other treatment groups, and giving 2,4 mg/Kg BW Plum extract could not decrease the MDA levels. The administration of Plum extracts was able to inhibit the increase in liver MDA levels at doses of 0.8 mg/Kg BW, 1.6 mg/Kg BW and 2.4 mg/Kg BW which were significantly different from the positive control group. However, the doses of 1.6 mg/Kg BW and 2.4 mg/Kg BW showed the same effectiveness because they were in the same subset, while the doses of 0.8 mg/Kg BW and 1.6 mg/Kg BW also showed the same effect with negative control group because they are in the same subset. Thus, it can be concluded that the effective dose of ethanol extract of Plum that can inhibit the increase in liver MDA levels in rats fed a high-fat diet is 0.8 mg/Kg BW.

**Table 2.** Duncan Test of liver MDA levels

| Groups | N | Subset for alpha = 0.05 | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| K1 Cotrol Negative | 3 | 0,097 | | |
| K3 Dosis 0,8 mg/KgBB | 3 | 0,107 | | |
| K4 Dosis 1,6 mg/KgBB | 3 | 0,111 | 0,111 | |
| K5 Dosis 2,4 mg/KgBB | 3 | | 0.133 | 0,133 |
| K2 Control Positive | 3 | | | 0,145 |
| Sig. | | 0,283 | 0.067 | 0,299 |

Description: K1: Negative control
K2: Positive control
K3: Plum extract *0,8 mg/Kg BW*
K4: Plum *extract 1,6 mg/Kg BW*
K5: Plum *extract 2,4 mg/Kg BW*

Plums contain fiber and vitamin C. In addition, and are also rich in antioxidants, including carotenoids and flavonoids, anthocyanins and quercetin. Carotenoid compounds can act as scavengers that can fight aging and diseases caused by free radicals. Most of the carotenoids in plums are beta carotene and the rest are beta-cryptoxanthin. In addition to beta carotene, flavonoids can also act as antioxidants. The ethanolic extract of Plum Fruit could work as an antioxidant by inhibiting the increase in liver MDA levels in rats precipitated by an excessive fat. Antioxidants can prevent the process of lipid peroxidation caused by free radicals, which can be produced from oxidative stress in liver damage due to a high-fat diet [9–11].

## 4 Conclusion

The Plum extract can inhibit the increase in liver MDA levels of Wistar strain rats induced by a high-fat diet with an effective dose of 0,8 mg/Kg BW.

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