



## EFFECT OF DURIAN FRUIT ON BLOOD PRESSURE

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### ABSTRACT

Durian or *Durio zibethinus* is a tropical fruit originating from Southeast Asia. Durian is often known as "King of Fruits". In Asian countries, durian is widely used as traditional medicine such as antipyretic drugs, anti-malaria, treating skin diseases, jaundice, anti-inflammation, boosting the immune system, wound healing and so forth. In fact, several studies have proven the health benefits of durian fruit such as antimicrobial, antidiabetic, anticholesterol, antioxidant, antiproliferative, antibacterial, antifungal, and others. The objective of this paper is to describe the effect of durian on cardiovascular especially blood pressure which is still controversial. This paper uses literature study involving 18 libraries both national and international journals or books. In conclusion, there are still many people who believe that consumption of durian causes hypertension or high blood pressure, whereas based on research, consumption of durian in a small amount does not affect blood pressure, only for patients with hypertension must be careful in consuming durian in large amounts.

**Keywords:** durian, blood pressure, systolic, diastolic, heart rate

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## INTRODUCTION

Until now, hypertension still poses a big challenge in the world and Indonesia. Based on the Riset Kesehatan Dasar (Riskesdas) 2013, hypertension ranks third as a cause of death in Indonesia and has a high prevalence of 25.8%. Hypertension is a condition that is often found in primary health care. Hypertension which is usually referred to as a 'silent killer' is a condition of systolic blood pressure of more than 140 mmHg and diastolic blood pressure of more than 90 mmHg with two measurements in a calm state and an interval of five minutes. High blood pressure if not detected early and controlled for a long time can cause many diseases such as kidney failure, coronary heart disease, stroke, and others (Ministry of Health, Republic of Indonesia, 2014).

Durian is a tropical fruit originating from Southeast Asia. Durian is a fruit derived from several species of trees in the genus *Durio*. There are about 30 *Durio* species and at least nine of them produce fruit that can be consumed. Not all durian species are available on the international market. *Durio zibethinus* or locally known as durian belongs to the Bombacaceae family and is the only species that circulates on the

international market (Lim, 2012).

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Durian thrives in hot, humid and wet climates with an average annual temperature of 24-30 °C and in the relative humidity of 75-90%. In order to flourish, durian requires growing in an area with a well-distributed rainfall. However, the dry season is also useful for stimulating the process of flower formation. Durian species grow best in the lowlands and cannot flourish above an altitude of 800 m and grow very well in adequately drained soils that are rich in organic matter, which has a pH range of 5-6.5. Durian cannot survive in puddled water. Soil conditions that are too wet can cause fungus growth on tree roots, which will then lead to growth disruption (Lim, 2012).

Popular durian cultivars that are consumed include Sitokong, Petruk, Sunan, Sukun and Simas from Indonesia; D2, D10, D24 and D99 from Malaysia; and Monthong, Chane, Kanyao from Thailand (Siriphanich, 2011). In general, durian can be consumed directly or made into food products such as jam, candy, ice cream, and various types of cakes. Besides that, durian seeds can also be eaten after being boiled or roasted and made into flour and durian chips. Young leaves and durian shoots can be cooked as green vegetables. In addition, dishes such as *pulut durian* and *tempoyak* are served together with durian (Striegel *et al.*, 2018)

The effect of durian on cardiovascular health is still controversial. Traditionally, durian is considered "generating heat". This belief comes from the nature of durian, which increases body temperature and increases blood pressure (BP). Therefore, pregnant women and individuals with high BP are advised not to eat it. However this belief has been proven not entirely true as some studies has proven that there was no significant difference in a person's blood pressure before and after consuming durian. The association on how durian affect blood pressure on both healthy and hypertensive subject has not been fully explored. Minimal number of journals and research can be found about it. This is the reason why the study about durian's effect on blood pressure important to be explored. The purpose of this paper is to describe the effect of durian on cardiovascular especially blood pressure using literature review method (Chua, 2012; Kumolosasi *et al.*, 2016).

## METHOD

The method that is used in this study is literature review. Literature review is a method that is used by a researcher to search, combine and analyze facts based on the manual and the latest research through databases such as PubMed and Google Scholar by conducting a review on the title, content and results. This review is a study to discuss the effect of durian fruit on blood pressure. There are 23 library sources used in this paper from 2008 to 2019.

## RESULTS

Research by Kumolosasi *et al.* (2016) entitled The Effects of Durian Intake on Blood Pressure and Heart Rate in Healthy Individuals which is done with a randomized method, single dose, non-blind design, and human subjects reported that there were no significant differences in a person's blood pressure before and after consuming durian. The study was conducted on four groups of subjects. Each group received an average amount of durian meat (250 g), a maximum amount of durian meat (500 g), and placebo (0 g). Durian meat that is given to the subject does not cause any adverse reaction or intolerance. Blood pressure and pulse are measured at intervals of 30 minutes, 1 hour, 2 hours, 4 hours and 24 hours post-study. The results shows there are a significant ( $p < 0.05$ ) increase on mean systolic blood pressure after 2 hours post-intervention for the group receiving placebo with the mean of 122.63 mmHg which is slightly above normal range ( $< 120$  mmHg). However subjects in the group receiving durian at the amount of 250 and 500 g did not show significant changes. Figure 1 also shows no significant increase in mean diastolic pressure before and after intervention. There was a significant increase in heart rate between 30 minutes to 2 hours time mark at the dosage of 500 g although the heart rate level were still within the normal range (60-100 bpm) but the number came back to normal after 2 hours as shown in figure 3 (Kumolosasi *et al.*, 2016).

Figure 1.  
Systolic Blood Pressure of the treatment and control groups(Kumolosasi *et al.*, 2016).

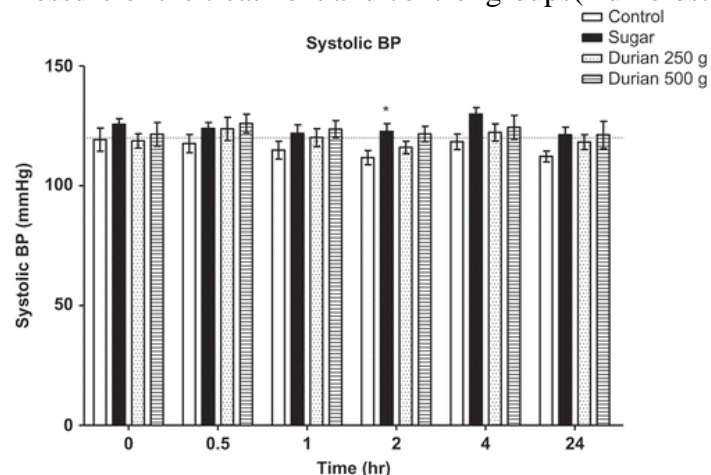


Figure 2.  
 Diastolic Blood Pressure of the treatment and control groups(Kumolosasi *et al.*, 2016).

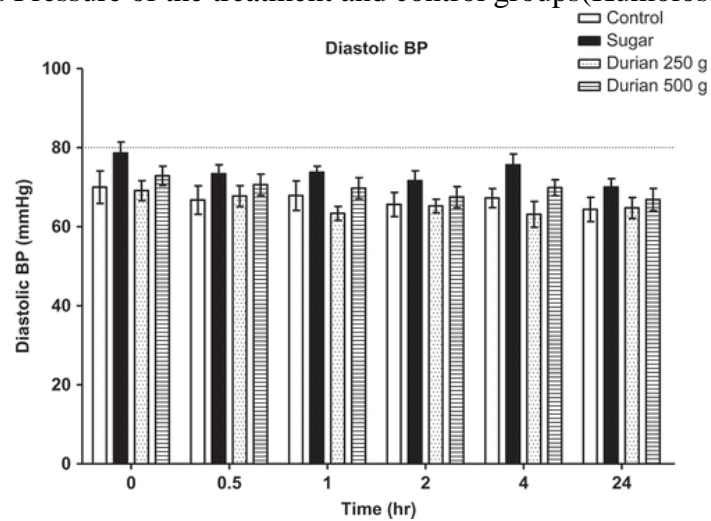
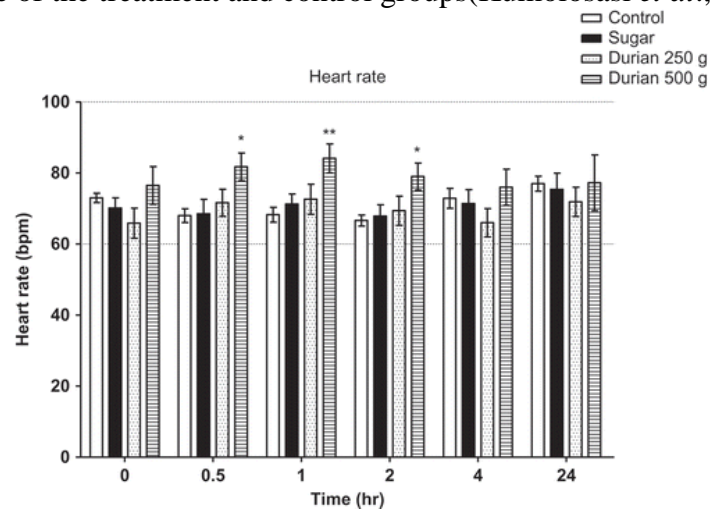


Figure 3.  
 Heart rate of the treatment and control groups(Kumolosasi *et al.*, 2016).



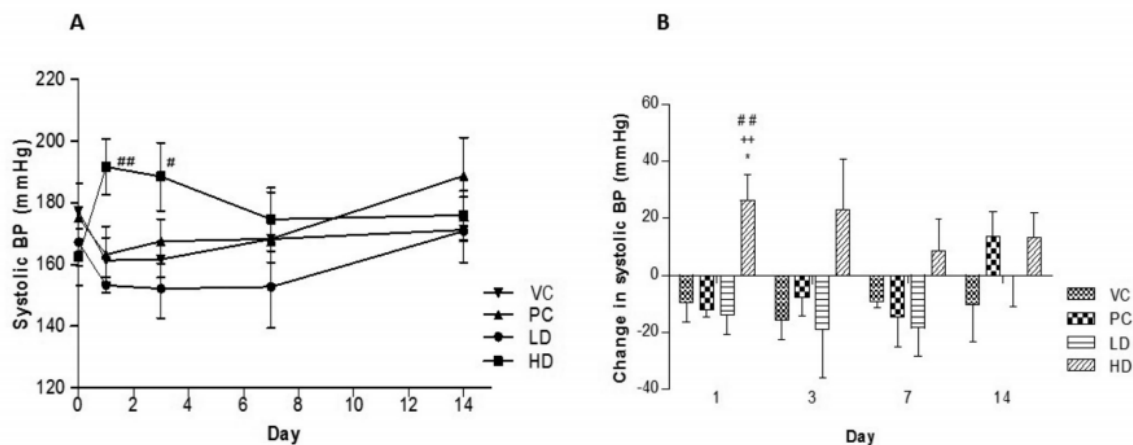
The research continued by Jasamai *et al.* (2018) in a study about the effect of durian fruit on blood pressure performed on spontaneously hypertensive rats. The study showed that durian fruit had an acute effect on blood pressure in hypertensive mice by changing systolic and diastolic blood pressure but did not affect the pulse of the rat. High doses durian fruit which is 52 g / kgBW showed a persistent elevation in both systolic and diastolic blood pressure even though the elevation only shown significant systolic at day 1 and 3; and at day 1 for diastolic blood pressure. However, low-dose durian fruit administration (26 g / kgBW) shown a decrease in systolic and diastolic blood pressure, although not significant. Rats with spontaneous hypertension showed tolerance to durian after three to seven days of oral administration of durian. From these studies it can be concluded that the consumption of durian in small amounts or low doses does not affect blood pressure and pulse, but in

patients with hypertension must be careful in consuming durian in large amounts (Jasamai *et al.*, 2018).

After the first dose of oral administration, the systolic blood pressure of the low dose group shown insignificantly decrease compared to the control group. In high dose group, the systolic blood pressure increased compared to the vehicle control group. However, this was also not significant. At day 1, the mean systolic blood pressure of the low dose and high dose groups shown significant difference ( $p < 0.01$ ,  $n = 5$ ) and day 3 with  $p$ -value  $< 0.05$ ,  $n = 5$ . Towards the end of study period, the oral administration, high dose, low dose and placebo control group showed an increase in mean systolic blood pressure, but the values were not significant compared to the control group as shown in figure 4 A and B. Figure 4 B shows the high dose group has positive mean change (increase) while other groups showed negative change (decrease). Figure 5 A and B shows the effect of different doses of durian on the diastolic blood pressure. On day 1, the high dose (52 g/kg) group generate a significant increase in diastolic blood pressure compared to placebo control group and low dose group ( $p < 0.05$ ,  $n = 5$ ). This profil was similar with systolic blood pressure's result where after day 2 until the end of study period (day 14) no more significant changes observed (Jasamai *et al.*, 2018).

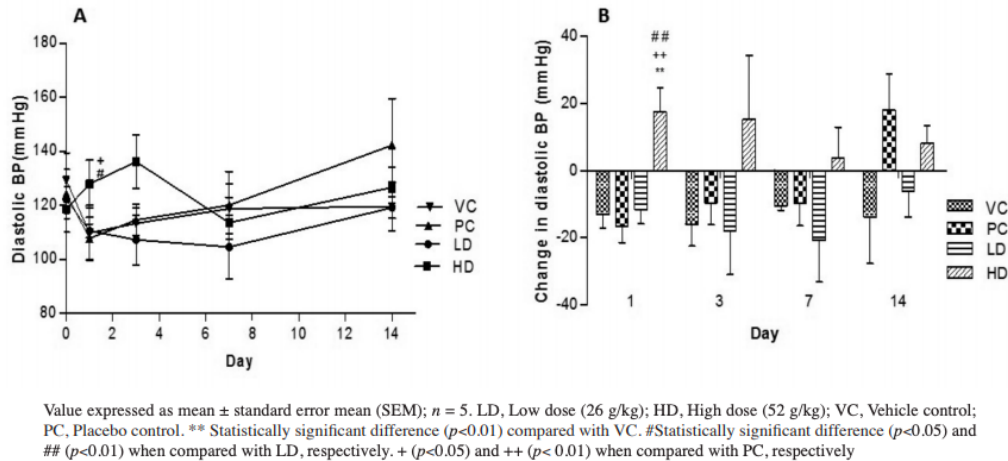
**Figure 4.**

(A) Systolic blood pressure (B) Change in systolic blood pressure throughout 14 days of experiment (Jasamai *et al.*, 2018).



Value expressed as mean  $\pm$  standard error mean (SEM);  $n = 5$ ; VC, Vehicle control; PC, Placebo control; LD, Low dose (26 g/kg); HD, High dose (52 g/kg). \*Statistically significant difference ( $p < 0.05$ ) when compared with VC. ++ ( $p < 0.01$ ) compared with PC. # Statistically significant difference ( $p < 0.05$ ) and ## ( $p < 0.01$ ) compared with LD, respectively

Figure 5.  
 (A) Diastolic blood pressure (B) Change in Diastolic blood pressure throughout 14 days of experiment (Jasamai *et al.*, 2018).



## DISCUSSION

High blood pressure (systolic and/or diastolic blood pressure  $\geq 140/90$  mmHg) is estimated to cause 7.5 million deaths worldwide which is about 12.8% of the total of all deaths. this number is predicted to be increased to 1.56 billion in 2025 (Mendis, 2010). Global status report On NCD World Health Organization (WHO) in 2012 noted there was 839 million cases of hypertension with more women compared to men. This accounts for 3.7% of total disability adjusted life years (DALYS) or 57 million DALYS (WHO, 2014). Uncontrolled high blood pressure is a major risk factor for many cardiovascular diseases such as coronary heart disease and stroke. In 2014 around 22% adults aged  $>18$  years had high blood pressure. The prevalence of raised blood pressure was consistently high among low, lower middle and upper middle income countries all having rates of around 40% while the prevalence in high income countries was lower, at 35% (WHO, 2016).

Hypertension is a disease that arises because of the interaction between certain risk factors such as family history of hypertension, gender, age, excessive alcohol and salt consumption, obesity, smoking habits and lack of physical activity. Hypertension in general can occur at any age, but is most often found in people aged 35 years and over (Hengli *et al.*, 2013). As you age, the risk of hypertension continues to increase. This can occur due to physiological changes in the circulatory system. Vascular endothelium will decrease its elasticity thereby increasing the heart's effort to pump blood and cause hypertension (Ismarina *et al.*, 2015).

Durian or *Durio zibethinus* is a tropical fruit originating from Southeast Asia. Each durian variety has various shape from round, ovoid, obovoid, or oblong with its outside ranging from green to brownish colored. The color of durian flesh is different from one variety to the others such as yellow, white, golden-yellow or red. Durian usually consumed raw and has a short storage period, from 2 to 5 days. Durian can also into food products such as

jam, candy, or *dodol* to extend its time limit for consumption (Striegel *et al.*, 2018; Aziz & Jalil, 2019).

Durian is a fruit that is rich in minerals such as calcium, magnesium, calcium, sodium, iron, zinc, copper and manganese; antioxidants such as vitamin E and beta-carotene; sulfur compounds such as ethanethiol, ethyl methyl disulfide, diethyl disulfide, ethyl n-propyl disulfide, diethyl trisulfide, 3,5-dimethyl-1,2,4-trithiolane, and 1,1-bis (ethylthio) -ethane; sugars like sucrose, fructose, and glucose. In addition to these components, durian is also a food source that is very rich in natural folate (Kumolosasi *et al.*, 2016; Striegel *et al.*, 2018)

In Asia, durian is widely used as traditional medicine. Durian leaves and roots are believed to have antipyretic effects; these leaf and root herbs are often used as fever-lowering drugs and anti-malaria. Durian is also used to relieve cold symptoms such as thinning phlegm, treating various skin diseases, jaundice and inflammations. Durian fruit is believed to have the properties to warm the body and potentially increase the immune system and wound healing. This fruit is also reported to have anti-oxidant, anti-cancer, anti-cardiovascular disease, anti-diabetes and anti-obesity and can improve digestion, reduce blood pressure, insomnia, relieve symptoms of depression and anxiety by improving mood, therefore avoiding stress disorders. The local community also believes that durian has a strong aphrodisiac effect and if eaten together with alcohol can cause death. However, there is no evidence to support this claim (Husin *et al.*, 2018).

Several studies have proven the health benefits of durian. Durian peel extract has been proven to be useful as an anti diabetic and anti hypercholesterolemia at a dose of 125 to 500 mg / kgBW (Muhtadi *et al.*, 2016). Durian also has anti-oxidant and antiproliferative effects because it contains polyphenols and flavonoids as well as the highest antioxidant activity in ripe durian besides ripe durian has the highest flavanol content (Haruenkeit *et al.*, 2010; Leontowicz *et al.*, 2011). The study of Sah *et al.*, (2014) also showed that the isolated durian compound had an antibacterial and antifungal effect on the microorganisms tested (Sah *et al.*, 2014). Durian fruit also has a significant effect as adjunctive therapy to treat infertility in Polycystic Ovary Syndrome (PCOs) (Ansari, 2016).

Different doses of durian had shown different affect on both systolic and diastolic blood pressure. In Jasamai *et al.* the opposite effect on the systolic blood pressure might be related to the different concentration of bioactive compounds that caused alteration in the mean systolic blood pressure. This finding suggests that low dose of durian might contain insufficient amount of bioactive compounds that can lead to mean systolic blood pressure elevation. there are differences in the results of research on healthy subjects and subjects with hypertension. Study by Kumolosasi *et al.* (2016) on healthy subject shown constant systolic and diastolic blood pressure values however, study by Jasamai *et al.* 2018 performed on spontaneously hypertensive rats showed that durian fruit had an acute effect on blood pressure in hypertensive mice by changing systolic and diastolic blood pressure. These results suggest that durian fruit has different affect on blood pressure of healthy humans or normal rats and hypertensive rats (pathological condition)(Kumolosasi *et al.*,

2016; Jasamai *et al.*, 2018).

A Study by Kumolosasi *et al.* (2016) indicates constant systolic and diastolic blood pressure values. This might be due to the beneficial components found in durians. Durian is a fruit that is rich in antioxidants, minerals, trace elements, sulphur compounds, and sugars. One of the minerals found in durian fruit is potassium. Potassium found in durian range from 70.00 to 601.00 mg per 100 g FW. This number is comparable to potassium-rich fruit such as banana, with the value of 358.00 mg per 100 g FW (Aziz & Jalil, 2019). Potassium is known to have a natriuretic effect that lowers blood pressure. Potassium is a compound that plays a task in maintaining normal functioning of the muscles, heart and nerve system, and potassium is the main regulator of blood pressure. An excessive amount of sodium within the body is a signal for the kidneys to increase blood pressure. Too little potassium gives similar effect. (Kowalski, 2010). Blood and fluid osmosis volume and pressure strongly associated with the concentration of sodium and potassium, which is very much controlled by a body mechanism settings that regulate the amount issued through urine and sweat, especially by hormones aldosterone. Mechanism of how potassium can lower blood pressure is by regulating peripheral and central nerves which then affects blood pressure. Different from sodium, potassium is the main ion inside intracellular fluid. Consuming lots of potassium will increase its concentration within the liquid intracellular so it tends to draw fluid from extracellular parts and lower blood pressure (Hardinsyah, 2017).

The characteristic of lowering blood pressure due to potassium content are also found in other food sources that are high in potassium such as bananas. The placebo in the study showed an increase in systolic blood pressure and diastolic blood pressure that remained normal or isolated systolic hypertension. This result might be due to sugar content where a high carbohydrate diet has been linked to an increase in blood pressure. However, there are limitations in the study due to the lack of measurement of blood glucose levels in the 500 g durian group who experienced an increase in pulse rate (Aburto *et al.*, 2013; Kumolosasi *et al.*, 2016).

Jasamai *et al.* (2018) also proved the analysis by Kumolosasi *et al.* (2016) that sugar content was associated with an increase in blood pressure. In a study by Jasamai *et al.* the placebo controls groups consume the same amount of sugar as in the low-dose durian group (26 g / kgBW). This method showed the result that mean systolic blood pressure in both groups after oral administration of durian fruit on the seventh day was caused by routine consumption of sucrose, fructose, and glucose contained in durian fruit. Fructose in durian can increase blood pressure and increase the accumulation of visceral adiposity, dyslipidemia, and fat accumulation due to increased lipogenesis in the liver. In addition to this, a diet that contains high amounts of sugar can trigger a rise in blood pressure about twice that on a high salt diet (Dinicolantonio & O'keefe, 2016; Kumolosasi *et al.*, 2016; Jasamai *et al.*, 2018).

## CONCLUSION

*Durio zibethinus* is a typical fruit found in Southeast Asia. Durian fruit has many benefits that are good for health. There are still many people who believe that eating even a little bit of durian can cause hypertension and other cardiovascular disease. This believes has been proven not entirely true. Consumption ion of durian in a small amount does not affect blood pressure. However, people with hypertension must be careful in consuming durian in large amounts.

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