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EFFECTIVENESS OF NONI FRUIT (MORINDA CITRIFOLIA L.) IN LOWERING HYPERTENSION: A SYSTEMATIC REVIEW



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ABSTRACT

Introduction: Hypertension is characterized by symptoms of an increase in systolic blood pressure > 140 mmHg and/or diastolic blood pressure > 90 mmHg and is a major contributor to diseases related to blood vessels such as stroke, heart attack, and kidney failure. Generally, most people use chemical drugs to reduce hypertension. Many studies have been conducted to look for chemical drugs with better effectiveness with minimal side effects through traditional medicine, for example using noni fruit. Purpose: This systematic review aims to analyze the effectiveness of noni fruit in reducing hypertension and the relationship between the content of noni fruit that can potentially reduce hypertension. **Methods:** The design used in this study is a systematic review (Systematic Review) using the Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) method. This method is carried out using reviews, analysis, structured evaluations, classifiers, and categorization of evidence-based that have previously been generated. The articles in this study were obtained from electronic databases published in Google Scholar, Pubmed, and Science Direct, which were published from 2013 to 2023. **Results:** Of the 7 articles showing that noni fruit can reduce hypertension. Noni fruit contains scopoletin and xeronine which have the potential to reduce hypertension. Scopoletin functions to widen narrowed blood vessels and can also reduce MDA levels in the body by increasing SOD activity in the body. Antioxidants in noni can inhibit oxidative stress so that it can reduce hypertension. The active ingredient noni scopoletin functions to normalize blood pressure with an effect similar to the workings of spasmolytic antihypertensive drugs. Characterized by the dilation of blood vessels (vasodilation) due to smooth muscle relaxation. In addition, the content of proxeronine, which is needed by the body to produce xeronine, is a diuretic by increasing fluid volume by expelling fluids through urine and contains potassium in acids that can reduce cholesterol (LDL) which affects blood vessels so that blood pressure can decrease. **Conclusion:** Noni fruit can reduce hypertension because it contains antioxidants, scopoletin, and proxeronine.

Keywords: Morinda citrifolia, hypertension, blood pressure

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INTRODUCTION

High blood pressure or hypertension is a medical condition in which there is a chronic (long-term) increase in blood pressure. Hypertension is characterized by symptoms of an increase in systolic blood pressure > 140 mmHg and/or diastolic blood pressure > 90 mmHg and is a major contributor to diseases related to blood vessels such as stroke, heart attack, and kidney failure. WHO reported that in 2011 around 972 million people or 26.4% of the world's population suffer from hypertension and this will reach 29.2% in 2025. In Indonesia, the prevalence of hypertension in 2018 has increased from

2013, according to the 2013 Basic Health Research figures. The incidence of hypertension was 25.8%, whereas in 2018 it increased to 34.1% (Kementerian Kesehatan Republik Indonesia, 2019).

Hypertension requires more attention in treatment because it is one of the most important factors causing a stroke. Therefore, minimizing the increase in the prevalence of stroke can be done by controlling hypertension. Generally, most people use chemical drugs to reduce hypertension. Chemical drugs have several disadvantages that have a negative impact on the body (Ode Abdul Haris et al., 2020).

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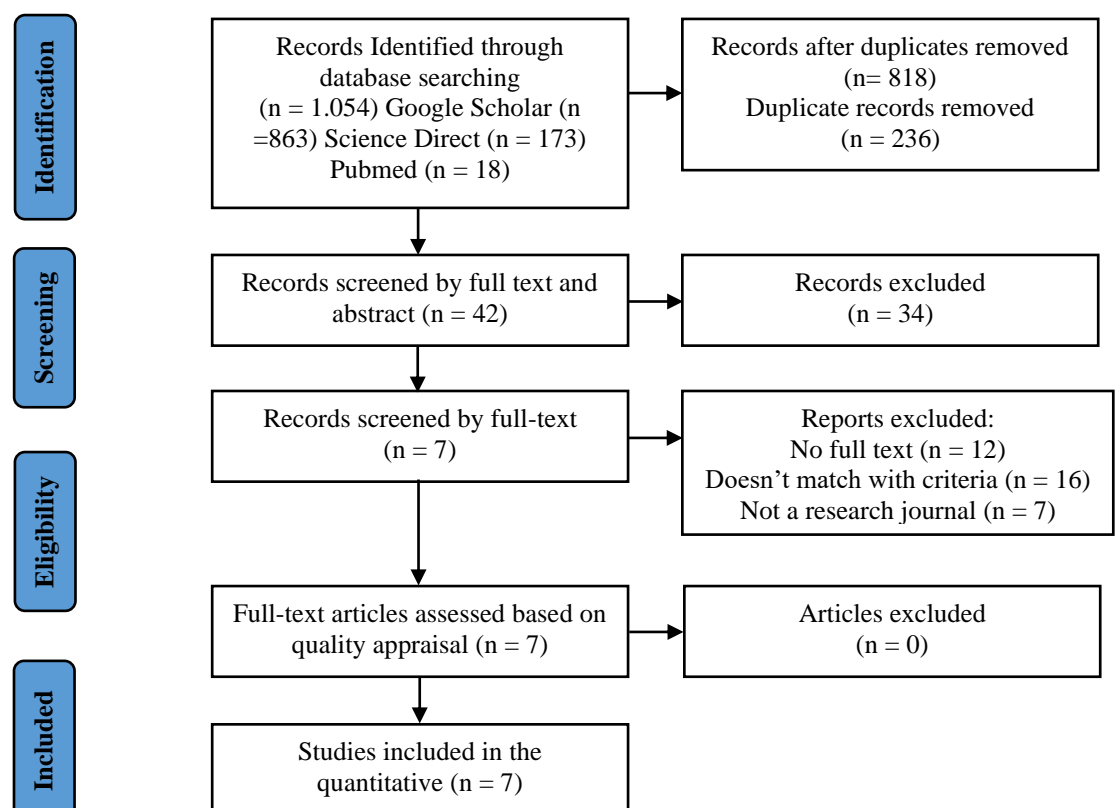
Many studies have been conducted to look for chemical drugs with better effectiveness with minimal side effects through traditional medicine, for example using noni fruit and cucumber. Previous studies have shown that noni juice can reduce hypertension (Nowak *et al.*, 2019). The results found that a significant reduction in blood pressure using noni juice (*Morinda citrifolia*).

Hypertension requires more attention in treatment because it is one of the most important factors causing a stroke. Therefore, minimizing the increase in the prevalence of stroke can be done by controlling hypertension. Generally, most people use chemical drugs to reduce hypertension. Chemical drugs have several drawbacks that have a negative impact on the body (Ode Abdul Haris *et al.*, 2020). Many studies have been conducted to look for chemical drugs with better effectiveness with minimal side effects through traditional medicine, for example using noni fruit and cucumber. Previous studies have shown that noni juice can reduce hypertension (Nowak *et al.*, 2019). The results found that a significant reduction in blood pressure using noni juice (*Morinda citrifolia*).

METHOD

Database Search

The design used in this study is a systematic review (Systematic Review) using the Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) method. This method is carried out using reviews, analysis, structured evaluations, classifiers, and categorization of evidence-based that have previously been generated. The steps in this study are summarized in Figure 1. The articles in this study were obtained from electronic databases published on Google Scholar, Pubmed, and Science Direct, which were published from 2013 to 2023. The keywords used for the literature search were “*morinda citrifolia*” AND “hypertension”. The inclusion criteria in this study were articles that were restricted within the last 10 years (2013-2023), in English, of the type of research articles, available in full-text form, and in which there is a discussion regarding the effectiveness of noni fruit (*morinda citrifolia*) in reducing hypertension. Exclusion criteria in the form of systematic reviews, and paid journals, not according to the topic.



Data Extraction and Reporting of Findings

Search for articles begins by using predetermined keywords, namely "Morinda Citrifolia" and "hypertension". From the search results using keywords obtained 863 articles from Google Scholar, 173 articles from Science Direct, and 18 articles from Pub-Med. After that, the sorting of multiple published articles published by Google Scholar, Science Direct, and Pub-Med was eliminated. After going through the process of eliminating articles that included the criteria, only 818

articles met the requirements. The screening was continued by looking at titles that included the words "Morinda Citrifolia" and "hypertension" or journals containing the words "noni" and "blood pressure" and then reading the abstracts of each article, a total of 42 articles were obtained. Furthermore, reading the full text of each article to see the relevance of the topics discussed and sorting the articles that can be accessed, the final result of the search found 7 articles that met the requirements and were suitable for use in a systematic review.

RESULTS

Morinda Citrifolia in Lowering Hypertension

Title	Methods	Respondent	Research Place	Results	Conclusion
Decrease Hypertention Throught Giving Noni Fruit Juice (Hariati et al., 2020)	This research was a quasi-experimental study with a one- group pre-post test design. The instrument used in this study was sphygmomanometers and observational sheets. Data analysis was performed using the Wilcoxon Singed-Ranks test $P < 0.05$ to determine the effect of the effectiveness of giving noni juice to blood pressure in patients with hypertension	The sample consisted of 15 hypertension patient in Durin and Tongal, Pancur Batu Distric with purposive sampling	Sumatera Utara, Indonesia	The results of this study indicated that before giving noni juice, the blood systole was deep category and after being given noni fruit juice, systolic blood pressure decreased. Diastolic blood pressure before being given noni juice was in the normal category and after being given noni fruit juice, the majority of diastolic blood pressure was in the decreased category.	This study showed that after being given noni juice, the majority of diastolic blood pressure decreased.
Study in vitro and in silico on effectiveness noni fruit extract (Morinda Citrifolia) to reducing hypertension (Ode Abdul Haris Hijriansyah, Subair, Alief Utama Armyn and Hakim, 2020)	The research method used was pre-test and post-test matched control group. Six Wistar rats were divided into 3 groups consisting of 1 treatment group and 2 control groups. Group P1 was induced using 0.05 ml ketamine + 0.2 ml epinephrine + 6 ml of noni fruit extract, group K (-) was induced by ketamine 0.05 ml + epinephrine 0.2 ml without extract, and group K (+) was induced using ketamine 0.05 ml + epinephrine 0.2 ml + captopril 2.5 mg.	Wistar rats aged 2-3 months and weighing > 150 grams. Six rats were used and divided into 3 treatment groups.	Indonesia	Noni can reduce systolic blood pressure with an average decrease in blood pressure of 58.5 mmHg. While captopril as a positive control with blood pressure of 25.5 mmHg with an average decrease in blood pressure of 25.5. Not only vitro tests, but also in silico tests proved that noni extract can significantly reduce hypertension compared to antihypertensive drugs (captopril) which contain an active compound (scopoletin) in noni. The affinity value of the scopoletin bond is -7.6. Meanwhile, the antihypertensive drug (captopril) only has a binding affinity value of -5.7. The	This study shows that epinephrine can be used as an inducer of hypertension. As much as 6 ml of noni fruit extract can provide an antihypertensive effect. In vitro, the test results showed that noni fruit extract can reduce blood pressure with an average decrease in blood pressure of 58.5 mmHg while captopril is 25.5 mmHg. In addition to in vitro tests, in-silico test results show that noni fruit extract can significantly reduce blood pressure compared to anti-hypertensive drugs

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				lower the binding affinity value, the stronger the binding of the active compound to the target cell. Therefore, the scopoletin contained in noni fruit has a greater (significant) ability to lower blood pressure compared to anti-hypertensive drugs (captopril).	(captopril). the scopoletin value of noni fruit is -7.6. and captopril only - 5.7.
Efficacy of Amlodipine-Noni Extract (Morinda citrifolia L.) Combination on Blood Pressure of Hypertension Patients (Kasih, Arfiyanti and Rakhmawatie, 2022)	This study used an observational design analysis with a cross sectional approach. The moderator variables studied included age, smoking activity, psychosocial conditions or stress, salt consumption, rest patterns, and alcohol consumption. Patients were then categorized based on the presence or absence of risk factors. Questionnaire for respondents tested for validity using Pearson product moment analysis, and declared valid with a value of r 0.775 to 0.902 (value > r table 0.444; $N=20$; $\alpha=0.005$). The reliability test was carried out by Cronbach Alpha analysis, and was declared reliable with an Alpha of 0.967 (value > 0.6). To assess the effectiveness of the combination of amlodipine-noni extract in lowering blood pressure used the Kruskal	The research respondents were the entire population of non-complicated hypertension patients at the Brati Health Center, Grobogan Regency, Central Java, Indonesia who were undergoing treatment in February 2021. The number of respondents was 85 people who were divided into four groups.	Jawa Tengah, Indonesia	Based on the results of the Kruskal Wallis analysis, there was a significant difference in the average increase in systolic blood pressure in all all groups (p-value 0.001). For diastolic blood pressure the K4 group experienced a decrease in diastolic blood pressure (Table 3), but the results of the Kruskal Wallis test did not show a significant difference in all groups of respondents (p-value 0.499). From these results it can be concluded that there is no difference in efficacy between the combination drug amlodipine and amlodipine-noni extract to reduce the patient's diastolic blood pressure. From the results of table 4, there is there was a significant difference in the increase in systolic blood pressure between groups K1 and K3 (p- value 0.019), K2 and K3 (p-value 0.001), and	This study shows that the amlodipine-noni combination extract was proven to prevent an increase in systolic blood pressure in hypertensive patients with risk factors at the Brati Health Center (p value 0.001), but not for diastolic blood pressure (p value 0.499).

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Hypotensive Activity of Ethanolic Extracts of <i>Morinda citrifolia</i> L. Leaves and Fruit in Dexamethasone-Induced Hypertensive Rat (Wigati <i>et al.</i> , 2017)	Wallis test followed by the Mann-Whitney test. The research method used is phytochemical analysis. Analysis was performed using thin layer chromatography (TLC), with silica gel 60 F254 stationary phase. The mobile phase of ethyl acetate-n-butanol-formic acid-aqua dest (5:5:2:1 v/v/v/v) was used for MCLEE. Detection of rutin content in MCLEE was carried out under UV wavelengths of 254 nm and 366 nm compared to routine standards. Routine quantitative analysis was carried out by measuring the spot intensity on a TLC scanner at a wavelength of 200 to 400 nm. MCFEE analysis used the mobile phase of toluene-acetic acid (4:0.5 v/v). The detection of scopoletin content in MCFEE was peeled with standard scopoletin and carried out under UV wavelengths of 254 nm and 366 nm. The Scopoletin level in MCFEE was calculated by measuring	Male Wistar rats weighing 150 to 200 g (2-3 months) used in this study were maintained under standard laboratory conditions in a 12:12 h light-dark cycle (light on at 07:00 am) at constant temperature (22± 2 °C) and relative humidity (55 ± 10%). All animals were fed standard laboratory food and water <i>ad libitum</i> .	Laboratorium Universitas Gadjah Mada, Indonesia	K3 and K4 (p-value 0.003). Based on these results it can be concluded that the lowest increase in systolic blood pressure occurred in the group of users of the amlodipine-noni extract combination drug with risk factors (K3). In that study, SBP, DBP, and MABP of dexamethasone-induced animals decreased after treatment with MCLEE, MCFEE, or their combination as well as the positive control group. The percentage of blood pressure reduction after MCFEE treatment was higher than that of MCLEE and MCFEE, and was close to that of the positive control group. MCFEE is a combination of MCLEE and MCFEE (1:1). Each extract contains different metabolites which may indicate a possible synergistic effect of the combined extracts. MCLEE contains the flavonoid rutin and MCFEE contains scopoletin as indicated by the marker compounds. The antihypertensive effect of <i>Morinda citrifolia</i> may be due to rutin and scopoletin. <i>Morinda citrifolia</i> leaves are high sources of antioxidants. This plant extract is able to prevent	This research shows that <i>Morinda citrifolia</i> fruit contains high antioxidants. This plant extract is able to prevent cell damage due to oxidative stress due to its antioxidant activity.

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	the spot intensity on a TLC scanner at a wavelength of 336 nm.			cell damage due to oxidative stress due to its antioxidant activity.	
The Effectiveness of Wet Cupping Therapy and Giving Noni Herbal Medicines Against Blood Pressure in Hypertensive Patients (Ramadani <i>et al.</i> , 2020)	The independent variables in this study were wet cupping therapy and administration of noni jamu fruit extract, while the dependent variable in this study was blood pressure. This study used a Quasi Experimental research method using a time control research design.	The population in this study were all hypertensive patients who received therapy in the working area of the West Singkawang Health Center as many as 199 people with a purposive sampling type. Data collection using a questionnaire to the family and patients was then analyzed by the Independent Sample Test.	Singkawang Barat	The results of observations of systolic blood pressure before and after treatment in cupping therapy and noni herbal medicine were obtained from the significance level of the P value = 0.087 from P Value > 0.05. So in this statistical test it is concluded that Ho is accepted and H1 is rejected. So that the results of this statistical test concluded that there was no significant (significant) difference in effectiveness between wet cupping therapy and the administration of herbal medicines in the Working Area of West Singkawang Health Center, Singkawang City.	It can be concluded that there is no significant (significant) difference in effectiveness between wet cupping therapy and the administration of herbal medicines in the West Singkawang Health Center Work Area, Singkawang City.
Back Massage and Noni Fruit (Morinda citrifolia) Reduced Blood Pressure in People with Hypertension (Lestari, Suardana and Trisnadianti, 2017)	This research is a quantitative research using the Quacy Experimental research design, namely is the Inequivalent Control Group Design. This research was conducted in the Working Area of PT North Denpasar II Health Center from	Respondents of this study were 26 people aged 60-74 years, systolic blood pressure and diastolic $\geq 140/90$ mmHg to 200/100 mmHg, consuming or not	Denpasar, Indonesia	The research results showed that there is a difference in systolic blood pressure thereafter treatment between the two groups with p-value 0.048. Diastolic blood pressure in medicine group and control group after treatment as well different from the p- value of 0.011. Means blood pressure (MAP) in the treatment group and control group after	Blood pressure in patients with primary hypertension in the treatment group and the control group during the pre-test and post-test were different. Based on the results of these tests and discussion, it is concluded that there is an effect of back massage and processed

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<p>April 10, 2017 to May 22, 2017. The variables in this study were blood pressure of hypertensive patients was obtained by measurement with a digital sphygmomanometer before and after 4 weeks as the result of pre-test and post-test treatment in the treatment group and control group. The statistical tests used were independent tests and paired tests to determine the differences and effects of back massage treatment and processed noni fruit.</p>	<p>hypertension drug, the patient is willing to be a respondent in this case research by signing an informed consent.</p>		<p>different treatment with a p-value of 0.005. these results are shown that there is an effect of providing backage and processed Noni fruit on blood pressure in patients with hypertension (p- value <0.05). Noni fruit can lower blood pressure because for the active ingredient scopoletin Stimulates blood vessels to perform vasodilation and xeronin which can increase production urine to decrease blood volume and leading to low blood pressure (12). This statement is also in line with previous research which reported that noni fruit extract lowered systolic, diastolic and mean arterial pressure significantly due to the presence of scopoletin which has the ability to dilate blood vessels walls that result in blood flow from the heart and the whole body become smooth and consequently reduces blood pressure.</p>	<p>noni fruit on blood pressure before and after treatment. Compared with control group, the difference results are minus value. It can be concluded that there is significant effect of back massage and processed Noni fruit on blood pressure in hypertension sufferers patients in the elderly aged 60-74 (elderly) because the same effect of vasodilation of blood vessels the two treatments, namely back massage and noni fruit fruit processing.</p>	
<p>Blood pressure lowering effect of scopoletin on oxidative stress-associated hypertensive rats (Armenia <i>et al.</i>, 2019)</p>	<p>The methods used in this study were systolic (SBP) and diastolic blood pressure (DBP), mean arterial pressure (MAP) and heart rate (HR).</p>	<p>Animal models (animal models). A total of 18 adult male Wistar-Kyoto rats (weighing \pm 250 g and aged 2-3 months) acclimated to</p>	<p>Faculty of Pharmacy Universitas Andalas, Sumatra Barat</p>	<p>In general, the blood pressure and heart rate of PNL animals were higher than those of subsequent PN animals hypertension induction. However, a comparative analysis of the parameters showed nothing significant difference between the two</p>	<p>It can be concluded that the blood pressure and heart rate pressure of PNL are higher than those of PN animals after hypertension induction.</p>

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		normal laboratory conditions with a 12:12 light/dark cycle for 7 days.		groups ($p>0.1$). In contrast to SBP and DBP, treatment did not significantly affect heart rate (HR) animals ($p>0.05$). Although HR fluctuated during the monitoring period, the parameter changes were not significant. However, the comparative effect in the two groups showed that the treatment caused a significant decrease in HR in the PN group, although in a small amount. In this group, scopoletin causes heart rate stabilized even though the other group showed dramatic changes. Effects of scopoletin on HR in both hypertension model for 120 minutes.	

DISCUSSIONS

Hypertension or high blood pressure is a condition when the pressure of the blood against the artery walls is too high. The prevalence of hypertension in Indonesia among people aged over 18 years reached 34.1% in 2018. Having a healthy lifestyle is very easy and cheap. A healthy diet, improving lifestyle to be more regular, and set rest times according to the body's needs, can prevent disease. According to Basic Health Research (Risikedas) data for 2018, the prevalence of hypertension in Indonesia has increased from only 27.8% in 2013 to 34.1%. Based on research, hypertension can occur at the age of twenty to thirties, but it can also occur before the age of twenties. It is estimated that 1.13 billion people worldwide suffer from hypertension, and about 2/3 live in low- and middle-income countries (WHO, 2023). This is because people with low income will find it difficult to have their blood pressure checked at the nearest hospital or health center because they do not have the funds to pay for a health check.

Of the 7 articles listed in the table, there are 6 articles which show that noni is effective in reducing hypertension ((Hariati *et al.*, 2020) (Ode Abdul Haris Hijriansyah, Subair, Alief Utama Armyn, Hakim, *et al.*, 2020) (Kasih, Arfiyanti and Rakhmawatie, 2022) (Wigati *et al.*, 2017) (Lestari, Suardana and Trisnadianti, 2017) (Armenia *et al.*, 2019)) and 1 article which showed that there is no significant effect between noni and hypertension (Ramadani *et al.*, 2020). Research shows that there is an effect of noni fruit juice on reducing blood pressure in hypertensive patients. before giving noni juice, blood systole was in the high category, and after being given noni juice, systolic blood pressure decreased. Diastolic blood pressure before being given noni juice was in the normal category and after being given noni juice, the majority of diastolic blood pressure was in the decreased category. (Hariati *et al.*, 2020). Research shows that noni fruit extract can reduce blood pressure with an average decrease in blood pressure of 58.5 mmHg while captopril is 25.5 mmHg. In addition to in vitro tests, in silico test

results show that noni fruit extract can significantly reduce blood pressure compared to antihypertensive drugs (captopril) (Ode Abdul Haris Hijriansyah, Subair, Alief Utama Armyn, Hakim, *et al.*, 2020). The study showed that the combination of amlodipine and noni extracts was proven to be able to prevent an increase in systolic blood pressure in hypertensive patients with risk factors at the Brati Health Center (p value 0.001), but not for diastolic blood pressure (p value 0.499) (Kasih, Arfiyanti and Rakhmawatie, 2022). Research shows that the content of rutin and scopoletin which makes noni antihypertensive. Morinda fruit contains high antioxidants. This plant extract can prevent cell damage due to oxidative stress due to its antioxidant activity (Wigati *et al.*, 2017). Research shows that there is no significant difference in effectiveness between wet cupping therapy and noni herbal medicine (Ramadani *et al.*, 2020). Research shows that there is a significant effect of back massage and processed noni fruit on blood pressure in elderly hypertensive patients aged 60-74 (elderly), (Lestari, Suardana and Trisnadianti, 2017). The research showed that the animal's blood pressure and heart rate became more stable after being given a treatment containing scopoletin. Scopoletin is one of the ingredients contained in noni fruit which can reduce hypertension (Armenia *et al.*, 2019).

Noni or *Morinda citrifolia* which can also be called noni has been used for centuries by the Polynesians as traditional medicine. This plant produces edible fruit. Noni contains chemical compounds that are important for health and the potential for isolation and use of new drugs from plants is still very productive for the development of new drugs to improve health services in certain medical fields (Shandil, 2020). Noni has therapeutic properties including antibacterial, antidiabetic, and antioxidant. *Morinda citrifolia* can also act as a lowering of blood pressure, lowering heart rate, and anticancer because it can increase immunity. The results of the study stated that *Morinda citrifolia* contains bioactive components such as flavonoids, triterpenes, triterpenoids, and saponins in

significant amounts. Flavonoid compounds contained in noni are useful as antioxidants (Nayak *et al.*, 2011). The antioxidants contained in noni fruit have enormous potential as a raw material for food products. Noni fruit is rich in antioxidants. This shift in the oxidant/antioxidant balance in favor of oxidants is called the "oxidative stress" (Birben *et al.*, 2012). Oxidative stress has been shown to increase arterial blood pressure by promoting functional nitric oxide deficiency (through NO inactivation and depletion of tetrahydrobiopterin) and by augmenting arachidonic acid oxidation and formation of the vasoconstrictive prostaglandin F₂ α . Therefore improving oxidative stress with antioxidant therapy can help reduce hypertension (Rodriguez-Iturbe *et al.*, 2003). Noni has the property of lowering blood pressure so it is very good for consumption by people with hypertension. Previous studies have also shown that ethanol extract from noni fruit can regulate blood pressure through compounds such as scopoletin in dexamethasone-induced hypertensive rats (Wigati *et al.*, 2017).

Noni fruit contains scopoletin and xeronine which have the potential to reduce hypertension. Scopoletin is one of the substances in noni which can bind to serotonin which is one of the important chemicals in the human body. Noni fruit contains one type of phytonutrient, namely scopoletin. Scopoletin serves to widen narrowed blood vessels and can also reduce MDA levels in the body by increasing SOD activity in the body (Ali *et al.*, 2016). The active ingredient noni scopoletin functions to normalize blood pressure with a spasmolytic effect. The spasmolytic effect is characterized by the dilation of blood vessels (vasodilation) due to smooth muscle relaxation, the effect is similar to the workings of antihypertensive drugs (Ode Abdul Haris Hijriansyah *et al.*, 2020). Noni fruit contains proxeronase enzymes and proxeronine alkaloids, both enzymes can form the active substance xeronine in the body. Proxeronine is a xeronine-forming substance (Widianto, Setyo Prayogi and Nuryadi, 2015). In lowering blood pressure, the mechanism of

action of xeronine is to reduce blood volume and remove sodium deposits from the body so that blood pressure will decrease (Kurniadi and Aprilla, 2022). In addition, the xeronin content in noni fruit can also act as a diuretic by increasing fluid volume by expelling fluids through the urine and the potassium content in acids which can lower cholesterol (LDL) which affects blood vessels so that blood pressure can decrease (Lestari *et al.*, 2017).

In the early 1990s, the first commercial noni products were launched in the US. Since then, various products derived from noni fruit, such as juice, pulp, powder, gel capsules, extracts, syrups and pills have been introduced to the market. One of the processed noni that can be consumed to reduce hypertension is in the form of juice. Noni juice is one of the preparations approved under the European Union's new food regulations in 1997. The Chinese government has also approved one of the sources of noni juice as a safe new source and has approved it as an immune-boosting functional food. Previous research also showed that there were significant differences in systolic and diastolic blood pressure of respondents in the hypertension group before and after being given noni juice to people with hypertension (Hariati *et al.*, 2020).

CONCLUSION

Hypertension is a condition when the blood pressure against the artery walls is too high. If left untreated, high blood pressure can cause health problems such as heart disease and stroke. Hypertension is a disease that can be caused by lifestyle and economic conditions. This is because people with low income will find it difficult to have their blood pressure checked at the nearest hospital or health center because they do not have the funds to pay for a health check. Noni or *Morinda citrifolia* which can also be called noni has been used for centuries as traditional medicine, this is because noni has therapeutic properties which act as lowering blood pressure, lowering heart rate, and anticancer because it can increase immunity. The antioxidants contained in noni fruit have enormous potential as a raw

material for food products. The content of active antioxidant ingredients, xeronin and scopoletin in noni fruit can lower blood pressure so it is very good for consumption by people with hypertension. There are many processed products derived from noni fruit, such as juice, pulp, powder, gel capsules, extracts, syrups, and pills which have been introduced to the market. One of the processed noni that can be consumed to reduce hypertension is in the form of juice. The study also showed that there were significant differences in systolic and diastolic blood pressure of respondents in the hypertension group before and after being given noni juice to people with hypertension.

RECOMMENDATIONS

Consuming noni fruit can lower blood pressure, this is because the noni fruit contains the active ingredients xeronin and scopoletin so it is very good for consumption by people with hypertension. It is recommended that noni fruit be processed in the form of juice to make it easier to consume. This should also be balanced with a healthy lifestyle, such as exercising regularly, reducing salt and sugar consumption, getting enough rest, reducing stress and regularly checking blood pressure.

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