Effect of Giving Kepok Banana Fruit (*Musa Acuminata X Balbisiana*) against Blood Pressure Reduction in Pregnant Mothers Trimester II

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Abstract. One of the highest causes of maternal mortality is hypertension in pregnant women, if not treated, Eclampsia will occur. One of the main causes of maternal mortality in North Sulawesi Province is hypertension. Data from Tuminting Health Center, Manado City, second trimester pregnant women suffer from hypertension 33.34%. The **p**urpose of this research is to analyze the pressure difference blood before and after giving kepok bananas to pregnant women in the second trimester. This research design uses a pre-experiment method with a one group pretest-posttest design Giving 42 pieces of kepok banana for 14 days pre-experiment with one group pretest-posttest. Analysis results data by using Uji Wilcoxon Signed Ranks Test found that before being given kepok banana fruit average systolic blood pressure 126.00 mmHg, and diastolic 89.33 mmHg whereas after being given kepok bananas the average value of systolic blood pressure was 120.67 mm Hg and diastolic 80.00 mm Hg, values obtained p-Value = 0,001 < 0,05. There is a very significant influence on the giving of kepok bananas to the reduction of pressure blood of pregnant women in the second trimester at the Tuminting Health Center in Manado City. There is an effect of giving ambon banana on reducing systolic and diastolic blood pressure in pregnant women. before and after giving ambon banana in the nla treatment group p = 0.031 (ρ < 0.05).

Keywords: Banana Kepok, Pregnant Women, Hypertension

1   Introduction

Hypertension in pregnancy, including chronic hypertension, gestational hypertension, preeclampsia/eclampsia, can cause death in pregnant women and fetuses so that there will be an increase in maternal, fetal and perinatal morbidity and mortality**.** Hypertension during pregnancy is not like hypertension that occurs in general, but has a close relationship with high morbidity and mortality rates for both mother and fetus. Hypertension is the leading cause of premature death worldwide. An estimated 1.28 billion

adults aged 30-79 years worldwide have hypertension, most (two-thirds) living in low- and middle-income countries An estimated 46% of adults with hypertension are unaware that they have the condition. Less than half of adults (42%) with hypertension are diagnosed and treated. About 1 in 5 adults (21%) with hypertension are under control. One of the global targets for non-communicable diseases is to reduce the prevalence of hypertension by 33% between 2010 and 2030.[1]

Ramón C.et al research 235 participants remained normotensive, 128 developed hypertensive disorders of pregnancy and 40 developed pre-eclampsia. The women were assessed by 48-hour ambulatory blood pressure monitoring (ABPM) in the first trimester of pregnancy, and then every 4 weeks until delivery. The use of predefined thresholds, which were tested prospectively, showed relatively little difference between healthy pregnant women and those with complications. Only 40 out of 546 (7.3%) normotensive pregnant women in the second trimester had a mean 48-hour systolic blood pressure (SBP) >110 mmHg, while 362 out of 412 (87.9%) with gestational hypertension or pre-eclampsia had a mean 48-hour SBP above this threshold. The results for hypertension were slightly greater for mean systolic (SBP) sleep. The results showed slightly greater mean blood pressure (BP) values between the two groups in the first trimester, and smaller samples during the third trimester. The sensitivity and specificity for diagnosing hypertension in pregnancy based on mean SBP increased with gestational age. For a given threshold above.[2]

The initial survey on February 6, 2019 at the Tuminting Health Center in Manando City obtained data in 2017 on the number of 961 pregnant women with 961 (100%) coverage of visits I (K1) of pregnant women and complete visit coverage (K4) of 801 (83%) pregnant women. In 2018 the number of pregnant women was 961 people with a coverage of visit I (K1) of pregnant women of 881 (91.67%) and a complete visit coverage (K4) of 872 (90.73%). The number of pregnant women with hypertension in 2017 was 83 (9.43%). In 2018 there was an increase of 117 (12.7%). Second trimester pregnant women as many as 45 pregnant women, who experienced hypertension as many as 15 pregnant women so that in the study sample 15 respondents.

Suwandi et al's research consuming ambon banana as much as 2 pieces per day for 7 days with a dose of ± 140 grams consumed morning and evening can be a solution to control blood pressure and reduce the degree of hypertension, especially in the elderly who are hypertensive, before giving bananas was 114 mmHg while after the banana ambon the average blood pressure value was 100 mmHg. This research is in line with the research of Zama et al that blood pressure before giving bananas averaged 114 mmHg while blood pressure after giving bananas Blood pressure decreased with an average pressure value of 100 mmHg with nla p = 0.001 (p <0.05, there is an effect of banana consumption on lowering blood pressure.[3]

2   Method

2.1   Research Design

This study used the pre-experimental method with the approach used being one group pretest-posttest, in this research design respondents were given treatment by

giving banana kepok for 14 days as many as 42 pieces then observed the results on day fifteen.

2.2   Study Setting and Sampling

The sample of respondents in this study was a total sampling (Siswanto et al, 2016). Criteria that can represent research subjects in a research sample that meets the requirements as a sample. Inclusion criteria are criteria for research subjects who can represent in the research sample that qualifies as a sample. namely: Inclusion criteria Pregnant women with high hypertension, second trimester pregnant women and willing to be respondents Exclusion criteria for pregnant women first and third trimester pregnant women with normal blood pressure, not willing. Pregnant women with blood pressure who are second trimester pregnant and willing to be respondents.

2.3   Data collection procedure

The researcher met with the head of Puskesmas to gain access and contract time with the midwife to determine the schedule and collect respondents to conduct the study. After recruiting respondents according to the inclusion criteria, a schedule was to start of the research and consent to participate was obtained.

The instrument used to collect the data was observation using an observation sheet, namely after giving banana kepok for 14 days and Sphygmomanometer blood pressure examination tool. Data analysis using non-parametric tests, where non-parametric and Wilcoxon matched pairs test, namely the Wilcoxon matched pairs test. Wilcoxon matched pairs test, namely the Wilcoxon signed ranks test. This study received ethical approval from the Health Research Ethics Committee of Poltekkes Kemenkes Manado

3   RESULT

3.1   Characteristics of the Study Sample

Table 1 shows that most respondents based on age aged 20-35 years 13 people (87%), Parity level shows that most respondents are multigravida 10 people (67%), Education level shows that most respondents have secondary education11 people (72%), Education level shows that most respondents do not work, namely housewives 12 people (80%).

Table 1. Distribution Characteristics of Respondents

Variable	N	%
1. Age		
20-35	13	87
<20 Years or >35 years	2	13
2. Parity		

Primigravida	5	33
Multigravida	10	67
3. Education		
Basis	4	27
Intermediate	11	72
4. Occupation		
IRT	12	80
Private	3	20

3.2   Blood Pressure Before Kepok Banana Intervention

Measure blood pressure before treatment on respondents, namely giving kepok bananas to respondents who meet the inclusion criteria for fourteen days given three fruits every day.

Table 2. Distribution of Respondents Based on Blood Pressure (*Pre-Test*)

	Blood Pressure							
	Systolic			Total	Diastolic			Total
	120	130	140		70	80	90	
Sum	7	7	1	15	-	1	14	15
%	47	47	6	100	-	6	94	100

Table 2 shows distribution of respondents based on blood pressure before all respondents were had their blood pressure measured, showing that most respondents had a systolic blood pressure of 120 and 130 mmHg (47%) and a diastolic blood pressure of 90 mmHg (94%).

Table 3. Distribution of Respondents Based on Blood Pressure (*Post-Test*)

	Blood Pressure							
	Systolic				Diastolic			
	120	130	140	Total	70	80	90	Total
Sum	13	2	-	15	1	13	1	15
%	88	12	-	100	6	88	6	100

Distribution of respondents based on blood pressure before treatment blood pressure was measured on all respondents and showed that most respondents had a systolic blood pressure of 120 mmHg (88%) and a diastolic blood pressure of 80 mmHg (88%) (Table 3).

Table 4. Distribution of Respondents Based on Min, Max, Mean Values

	Pre-Intervention			Post Intervention		
	Min	Max	Mean	Min	Max	Mean
Systolic	120	130	124	120	120	122,69
Diastolic	80	90	89,33	70	90	80

Tabel 4. Shows that blood pressure (*Pre-test*) in respondents who have the lowest systolic blood pressure of 120 mmHg and the highest value of 130 mmHg. Blood (*Post-test*) in respondents who had the lowest diastolic blood pressure of 80 mmHg and the highest value of 90 mmHg.

3.3   Bivariate Analysis

Based on data obtained from blood pressure measurements before and after the intervention in the form of giving bananas, a hypothesis was carried out to test the significant effect between the independent variable and the dependent variable using SPSS version 25.

Table 5. Results of data normality test using *Shapiro-Wilk Test*

Blood Pressure	Test	Sig	*p-Value*
Systolic	*Pre-Test*	0,001	
	Post-Test	0,001	$\geq 0,05$
Diastolic	*Pre-Test*	0,001	
	Post-Test	0,001	

in the intervention group

The p-value in pre-test and post-test respondents < 0.05 (Tabel 5). Based on the results of the normality test, it can be concluded that all data are not normally distributed so that the data can only be tested with nonparametric.

3.4   Wilcoxon Signed Ranks Test

Based on the data obtained from the results of pre-test and post-test blood pressure tests of respondents, then a hypothesis was carried out to test the significant independent variable, namely Kepok Banana Fruit and the dependent variable was the Blood Pressure of pregnant women with the test Wilcoxon Signed Ranks Test. With the results of the Wilcoxon Signed Ranks Test as follows:

Table 6. Wilcoxon Signed Ranks Test Results.

| | Blood Pressure | | | | | |
| | Systolic | | | Diastolic | | |
	Mean	Standard Deviation	P	Mean	Standard Deviation	p
Pre-test	126.00	6.325	0.011	89.33	2.582	0.001
Post-test	120.67	4.577		80.00	3.780	

Tabel 6 shows blood pressure in respondents before and after treatment decreased systolic blood pressure by 5.3 mmHg while diastolic blood pressure also decreased by 9.3 mmHg. The results after being given bananas kepok average value of systolic blood pressure 120.67 mmHg and diastolic 80.00 mmHg, obtained *p-Value* = 0.001 <0.05. This proves that there is a decrease in blood pressure after the intervention is given to the respondents. The results of the mean value, it is known if the mean value in respondents has decreased which means that giving banana kepok has an effect on reducing blood pressure in pregnant women with hypertension. It can be concluded that there is an effect of giving banana kepok (*Musa Acuminata X Balbisiana*) on Blood Pressure Reduction in Second Trimester Pregnant Women at Tuminting Health Center Manado City.

4   Discussion

4.1   Age

Age is a factor that needs to be considered for a woman to get pregnant. The incidence of hypertension in pregnancy can be influenced by several factors, namely maternal age (<20 or ≥35 years), which is a predisposing factor for the occurrence of hypertension in pregnancy. Age 20-30 years is the safest period for pregnancy/childbirth. Women who are at the beginning or end of reproductive age, are considered vulnerable to pregnancy complications. Each primigravida adolescent has a greater risk of developing hypertension in pregnancy and the relationship of increasing maternal age to gestational hypertension is the same, increasing at age over 35 years.The age of pregnant women is categorized into three categories, namely; < 20 years, 20-35 years, > 35 years. < 20 years of immature reproductive organs for pregnancy, so the mother's body is not ready to accept new conditions, so it can cause pre-eclampsia. While at the age of > 35 years it is easy to occur diseases in the mother and the aging uterine organs at this age are usually accompanied by diseases such as diabetes, hypertension causing pathological changes.The results showed that respondents who had a vulnerable age of < 20 years and >35 years were 13%.

4.2   Parity

Parity is one of the factors that influence the occurrence of hypertension in pregnancy. The impact of hypertension that occurs during pregnancy will cause health problems in pregnant women and the fetus they are carrying. Hypertension usually occurs in the first pregnancy, pregnancy < 20 years of age and pregnancy > 35 years of age. parity occurs in primigravida mothers because in primigravida there can be blockage of blood vessels in multigravida due to too frequent tense uterus during pregnancy found edema and hypertension.7 The results showed that most respondents had a parity status of multigravida or mothers who had been pregnant more than once, namely 67%.

Parity 2 to 3 is the safest parity in terms of maternal mortality. Mothers with high parity of more than 3 have high maternal rates because endometrial disorders can occur. Meanwhile, the first parity is risky because the uterus has just received conception for the first time and the flexibility of the uterine muscles is still limited for fetal growth.[4]   The incidence of hypertension in pregnant women in employment does not have any influence.2 Most respondents have secondary education (SMK / SMA graduates) as much as 72%. It does not show a certain pattern so that education does not have an influence on lowering blood pressure in pregnant women.

4.3   Occupation

Pregnant women who do work that requires standing for a long time are at risk of increasing blood pressure in various activities that demand physical activity.2 Most of the respondents' occupations were 80% housewives. This shows that work has no effect on lowering blood pressure in pregnant women.

4.4   The Effect of Giving Kepok Banana

The results of this study were 15 second trimester pregnant women who were at Tuminting Health Center, Manado City. Respondents consumed kepok banana fruit given 3x/day for 14 days. The stage in this study is to conduct a Pre-Test by measuring blood pressure in pregnant women carried out on 15 pregnant women with 15 respondents given kepok banana fruit which must be consumed by respondents every 3x / day for 14 days. The results obtained from research for 14 days all respondents did a post-test by measuring blood pressure turned out to have a decrease in systolic blood pressure of 120.67 mmHg and diastolic 80.00 mmHg. The results showed that the average blood pressure in respondents before and after treatment decreased systolic blood pressure by 5.3 mmHg while diastolic blood pressure also decreased by 9.3 mmHg.

After the Wilcoxon Signed Ranks Test with a meaning value of 0.05 that P = 0.011 <0.05 on systolic blood pressure and P = 0.001 <0.05 on diastolic blood pressure, so it can be concluded that there is a decrease in blood pressure that Ha is accepted, meaning that there is an effect of giving kepok banana fruit (Musa Acuminata x Balbisiana) on lowering blood pressure in Trimester II pregnant women at Puskesmas Tuminting Manado City.

Research by Ira Pujiani et al. The average systolic blood pressure of 145 mmHg after the treatment of giving banana ambon as much as 400 grams a day with a dose

of 200 grams in the morning and 200 grams in the afternoon, decreased systolic pressure to 126. from 171 mmHg with a value of p=0.445 (p>0.05). 445 (p>0.05) when compared to the average systolic blood pressure before treatment and diastole from 90mmHg to 83.4286 with nla p=0.031 (p<0.05) while in the control group that was not given treatment in diastole did not decrease and even increased from 91 mmHg to 93 mmHg.[5]

Fitri, Y et al, that the difference in systolic blood pressure consuming unpeeled banana juice for seven days with a dose of 300 ml every morning with a composition of 100 g banana and 200 ml of water every day in the elderly Systolic Blood Pressure 156.6 mmHg to 135.25 when compared with the provision of Banana Juice that has been peeled from 163.25 to 132.25 there is a difference before and after the banana juice both peeled and unpeeled.   Likewise with Diastolic blood pressure consuming unpeeled banana juice for seven days with a dose of 300 mL every morning with a composition of 100 g banana and 200 mL of water every day in the elderly there is a difference before and after being given, namely diastolic blood pressure 88.75 mmHg to 67. 25 and the provision of unpeeled ambon banana juice decreased from 86.88 to 74.38 while in the diastolic blood pressure before being given unpeeled ambon banana juice 88.75 mmHg, and after being given it became 67.25 and in the ntervention group giving peeled ambon banana juice before the intervention 86.88 after the intervention [6].

Women/pregnant mothers with a family history of hypertension have a 2.60 times higher risk of developing preeclampsia compared to women/pregnant mothers with no family history of hypertension. Pregnant women who have a family history of preeclampsia are 5.24 times more likely to develop preeclampsia compared to those who do not have a family history of preeclampsia [7].

The results of this study are also in line with research conducted by Sarah et al that the administration of 150 grams of banana containing 537 mg of potassium for 7 days has a positive impact on lowering blood pressure in the treatment group from 152.47 mmHg blood pressure to 146.13 mmHg with a p value of 0.000 compared to not given an average of 151.67 mmHg to 153.07 on day 7 [8].

There was no association between maternal age and systolic blood pressure, but diastolic blood pressure increased with maternal age by 0.25 mmHg per year of age. significant increase, with no clinical symptoms, occurred between the ages of 18 and 37 years. In 90% of pregnancies there is an increase in diastolic blood pressure of about 5 mmHg. When correlated by parity, there was no statistically significant association. Systolic and diastolic blood pressure remained constant within percentiles during the second 10-34 weeks of pregnancy, with a slight increase towards the end of pregnancy. The maximum increase was about 10 mmHg for systolic blood pressure and 5 mmHg for diastolic blood pressure [9].

There was a difference in blood pressure between the intervention control groups (P < 0.05). The systolic and diastolic blood pressure were lower in the intervention group   than in the control group. Bayesian meta-analysis showed that systolic and diastolic blood pressure in the intervention group decreased by 3.34 mmHg and 2.14 mmHg, respectively. Subgroup analysis supports that as long as healthy pregnant women exercise, their blood pressure can be modestly controlled, while pregnant women who are prone to hypertension can significantly lower their blood pressure [10].

In Campbell's study, seven women with baseline blood pressure developed gestational hypertension after mid-pregnancy without proteinuria, (3.2%) developed pre-eclampsia (hypertension and proteinuria), six cases occurred in women with normal baseline blood pressure and were described as moderate, and one severe case was superimposed on pre-existing hypertension. 22 women (10%) developed hypertension in their first pregnancy. Analysis of the 22 women who developed hypertension in their first pregnancy after health screening showed that 72.7% were Indigenous Australians; the remaining 27.3% of women identified as Torres Strait Islander or Torres Strait Islander or Indigenous Australian there was no difference in mean age between women who had hypertension during pregnancy [11].

Diana E's study 235 normotensive pregnant women with clinical and demographic characteristics averaged 3 to 6 clinic blood pressure measurements obtained at the time of the first and last visit (before delivery). normotensive pregnant women and women with gestational hypertension or preeclampsia samples were obtained by 48-hour ABPM in the second trimester of pregnancy (14 to 27 weeks gestation). Each graph shows hourly means and standards. The Apgar score was determined by assessing the neonate based on five criteria on a scale of 1 to 2, namely appearance, pulse, grimacing, activity, and breathing.   The newborn Apgar score was determined by assessing the newborn on five criteria on a scale of 1 to 2, namely appearance, pulse, grimacing, activity, and respiration [12].

 Daria Wohlt's research on bananas, all values are expressed as the mean of three experiments (n = 3) ± standard deviation. Means were compared using Tukey's test (p < 0.05) to determine significant differences among → between samples higher percentage of banana peel polyphenol oxidase (PPO) isoenzyme of banana peel. Characterization and inactivation studies of extraction adaptation were carried out for 'Prata' banana peel PPO, 'Cavendish' peel PPO extracts under optimal extraction conditions. demonstrates the applicability of PPO extraction regimes for peels of other banana varieties [13].

Aline Pereira's research on Banana (Musa spp) from skin to pulp for human health Banana pulp and peel can be used as a natural source of antioxidants and provitamin A, as they contain carotenoids, phenolics, and amine compounds. For the development of phytomedicine or even allopathic medicine, banana pulp and peel can be a raw material as they are rich in bioactive compounds that are beneficial to the body. he biological potential of the biomass is directly related to its chemical composition, particularly as a pro-vitamin A supplement, as a potential antioxidant due to its phenolic constituents and as a source of L-dopa and dopamine, which can be used in the treatment of Parkinson's disease [14].

Orietta Segura-Badilla's research on banana peel (Musa cavendish) as an ingredient in pasta and bakery   for different products (biscuits, bread, and pasta). The acceptability index between the products based on the composition of the BPF composition was   carried out using Student's t-test and one-way ANOVA. Dunnett's post-hoc test was used to determine the differences between the formulated products, considering the group without BPF addition as the control group. Statistical analysis was performed using GraphPad Prism for Windows (La Jolla, CA, USA). Statistically significant differences were considered significant when p < 0.05. Microbiological analysis of banana peel flour was performed to evaluate the effectiveness of the disinfection

process. Samples were tested in triplicate for mesophilic aerobic bacteria, coliforms, Salmonella sp. coli, molds, and yeasts   using the cup pour method [15].

Study by Pramono et al. Banana feeding reduced systolic and diastolic values on a daily basis. Systolic data (A-B) showed a significant reduction in blood pressure (p=0.00). The systolic trend line shows a daily decrease in the treatment group compared to the control group. The diastolic data (C-D) showed a significant reduction in blood pressure (p = 0.00). The diastolic trend line shows that the treatment group had a daily decrease, compared to the control group. Data A and C represent mean ± SD and are from two independent experiments (*, P < 0.05) Pre-treated banana peels as a source of phenolic compounds: Extraction kinetics, ultrasound optimization, and conventional extraction methods [16].

Kongkoli et al research to determine the effectiveness of cucumber and banana ambon fruit in reducing blood pressure in hypertensive patients by giving banana ambon fruit (Musa Acuminata Cola) There are differences before and after treatment in both groups, there is no difference in effectiveness in the sample in both treatments the same. Conclusion: Cucumber and banana fruit are effective in lowering blood pressure [17].

Dina's research Raja Bandung bananas prevented an increase in systolic blood pressure in rats tested Acute stress can significantly increase systolic blood pressure, but the administration of Raja Bandung bananas was shown to prevent this and had the same effect as diazepam. From these results, it can be concluded that the consumption of two medium-sized Bandung King Bananas provides better results under stressful conditions or under the pressure of people who are about to perform strenuous exercise. Among the restraint groups (B, C, D), group D had the lowest increase in blood pressure (23.22 followed by group C (27.21%). Group B had the highest increase (59.38%). Statistically, the increase in blood pressure in the control group was significantly different between the treatments of water (B) and diazepam (C) and between water and *raja bandung* banana (D). Administration of diazepam and Bandung King Banana can suppress the increase in SBP [18].

Chris L analyzed the utility of eggs and bananas as novel CT markers specific for PH. Their specificity is further enhanced when used in conjunction with classic diagnostic markers such as main pulmonary artery (PA) diameter and PA-to-Ao ratio. With advances in treatment strategies, early diagnosis is essential to reduce morbidity and mortality. Identification of the egg and banana sign should encourage further diagnostic evaluation and may help in the early diagnosis of pulmonary hypertension (PH) [19].

The largest age group of respondents was 51-60 years. 57.1% of hypertension is the most prominent cardiovascular disorder in this study observed that there was a decrease in systolic and diastolic blood pressure, after the administration of banana [20]. The study by Erkan Kalafat et al included 143 participants with gestational hypertension (GH) 80 home blood pressure monitoring (HBPM), 63 standard care. There was no significant difference between the two groups in maternal height-dependent unit admission, birth weight, fetal growth, neonatal composite and neonatal intensive care unit admission (p=0.999). The number of Day Assessment Unit (DAU) visits was significantly lower in the HBPM group compared with the traditional

group. The difference was greater when the number of visits was adjusted for the duration of monitoring in weeks. There was no difference in the number of outpatient visits and triage visits between the two groups. However, the total number of antenatal visits adjusted for monitoring duration was significantly lower in the HBPM group compared to the traditional group (P = 0.020). 57.1% hypertension is the most common cardiovascular disorder, and this study found that there was a reduction in systolic and diastolic blood pressure after administration of banana peels [21].

This research is supported by Rika Ruspita et al that of banana ambon about P on increasing hemoglobin levels in pregnant women that the results of calculating the Wilcoxon Signed Rank Test, the Z-value obtained is -2.859 with a P-value of 0.004 (P-value <0.05) there is a significant influence between hemoglobin levels before and after ambon banana. at BPM Yuni Wati Amelia Pekanbaru [22].

M. Fathima-Jebin's study showed a significant increase in SBP, PP, and MAP with a decrease in HR and no significant difference in DBP, RPP, and Do P at the post-test assessment compared to the baseline assessment. The analysis also showed similar results (changes) in all variables in both male and female groups as in the research group (n = 20) (9 males and 11 females) except for RPP. RPP increased significantly in the male participants,   whereas it did not change in the female participants [23].

5   Conclusion

This study aims to examine the blood pressure before and after giving kepok banana (Musa Acuminata x Balbisiana) to pregnant women second trimester. The results of this study showed blood pressure before giving kepok banana (Musa Acuminata x Balbisiana) for 14 days (42 pieces) there was a decrease in blood pressure after giving banana kepok both in systolic and diastolic blood pressure, but a more significant decrease occurred in systolic blood pressure than diastolic. The average   mean of the respondents with systolic blood pressure after consuming kepok banana fruit is 120.67 mmHg and diastolic blood pressure is 80.00 mmHg. The results of the study can be used to inform and benefit the effect of giving banana fruit (musa acuminata x balbisiana) on lowering blood pressure in pregnant women.

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