

# The Effect of *Caesalpinia Sappan* Linn to Decrease Blood Glucose Level on Diabetes Type II Patients

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Abstract: The prevalence of blood glucose control problems is higher in Indonesia. Orally administered antihyperglycemic agents (OHAs) have various side effects, and it can't control blood glucose level by single doses. Diabetes management used complementary therapies as support the administration of OHAs can help to control blood glucose levels. *Caesalpinia Sappan* Linn wood has substances high antioxidant and anti-hyperglycemic that can be used as support therapy in stabilizing blood glucose levels. The aim of this study was This study used the pretest-posttest control group design. Thirty-two subjects were recruited using a purposive sampling method. T-Independent test analysis was employed ( $p < 0,05$ ). The result showed the provision of stew *Caesalpiniasappan* Linn wood as support of OHAs therapy gave a significant effect of 54.51% compared with control ( $p = 0,010$ ). *Caesalpinia sappan* Linn has a brazilin content as a transporter that helps the pancreas work in insulin secretion. People with diabetes with uncontrolled blood sugar can take of drinks *Caesalpinia Sappan* Linn as a supporting the consumption of OHAs.

## 1 INTRODUCTION

Diabetes mellitus type 2 is a metabolic disorder that is characterized by hyperglycemia and disturbance of carbohydrate, fat, and protein metabolism because inadequate of insulin production, the resistance of insulin action, or both (Holt *et al.*, 2016). The prevalence of DM type 2 accounts for 90% of all of the diabetes cases worldwide (WHO, 2017). The largest increases in the prevalence of diabetes in the world will take place in the regions where economies are moving from low-income to middle-income levels, such as Indonesia (IDF, 2015). The prevalence of diabetes in Indonesia is in sixth place worldwide and the largest number in Southeast Asia (IDF, 2017).

Lifestyle modification can improve glycemic control significantly in diabetes type 2 or prediabetes people (West-Pollak *et al.*, 2014) and treatment with oral antihyperglycemic or insulin (Yki-Järvinen *et al.*, 2014; Ishii *et al.*, 2017). Unfortunately, it so many reports that those regimens had a fatal side effect. Based on meta-analysis and various studies show that many oral antihyperglycemics, i.e. metformin, sulfonylurea, and thiazolidinediones or in combination with other oral agents could increase cardiovascular and mortality risk in individual with

diabetes type 2 (Kahler *et al.*, 2007; Rao *et al.*, 2008; Shimoda and Kaku, 2016) and either insulin could increase risk of severing hypoglycemia (Ghosh *et al.*, 2017).

Supporting treatment is needed to improve the glycemic control of diabetes patients. One of them is a complementary therapy, for example, traditional treatment. Based on study by Chinnala, Elsani, and Nalla (2015) in India found that traditional medicine, the *Caesalpinia Sappan* Linn plant used for the treatment of diabetes mellitus, can reduce the development of complications and more significantly reduce blood glucose levels, cholesterol, and total triglyceride levels and total protein serum levels than Glibenclamide 10 mg/kg body weight (Chinnala, Elsani, and Nalla, 2015). This study was conducted to know the effect of *Caesalpinia Sappan L* on blood glucose level on diabetes patients type 2.

## 2 METHOD

This research used Quasi-Experimental Design and pretest-posttest control group design approach. The sampling method used a non-probability sampling technique i.e. purposive sampling. The total of

subjects were 32 and divided into two groups, 16 intervention group, and 16 control group, respectively. The intervention group was given decoction of *Caesalpinia Sappan* Linn wood (*Caesalpinia Sappan* Linn), which has been boiled with 5 cc/kg BB of water. The boiling process needed 20 minutes with temperature 70 °C, whereas the control group was given standard treatment following the therapeutic regimen given by the doctor. Dosis of treatment was once a day for 7 days. Data analysis used *Independent T-test*.

### 3 RESULTS AND DISCUSSION

#### 3.1 Respondents Characteristics

Table 1: Results of Analysis of Body Weight, Age, Genetic Factors and Diabetes duration in Intervention Group

Intervention Group				
Sample	Weight (Kg)	Age (year)	Duration (year)	Genetic
1	46	52	3	Yes
2	57	64	3	No
3	60	70	5	Yes
4	76	49	8	No
5	65	47	5	No
6	52	63	7	No
7	61	55	5	No
8	49	60	7	Yes
9	51	70	9	Yes
10	49	70	6	No
11	54	51	5	No
12	53	57	4	No
13	51	63	3	Yes
14	50	60	3	Yes
15	55	57	8	No
16	62	57	2	No
Mean	55,68	59,06	5,18	

Table 2: Results of Analysis of Body Weight, Age, Genetic Factors and Diabetes duration in Control Group

Sample	Weight (Kg)	Age (year)	Duration (year)	Genetic
1	51	60	3	No
2	61	59	5	No
3	69	62	8	Yes
4	62	52	8	Yes
5	76	55	3	Yes
6	58	53	3	No
7	60	61	3	No
8	66	60	7	Yes
9	50	55	5	No
10	60	65	5	Yes
11	58	66	4	No
12	85	65	6	No
13	56	56	3	No
14	64	62	5	Yes
15	59	63	3	No
16	62	59	6	No
Mean	62,31	59,56	4,81	

Based on Table 1 and 2 shows that the demographic data in the two groups were no significant difference. The sample in the intervention group and the control group had an average age that was not much different from the average age of 59.06 in the intervention group and 59, 56 in the control group. The average sample weight data in both groups also did not show much difference; in group A the average body weight was 55.68 kg, while in group B, it was 62.31 kg. Data on the length of time for diabetes in both groups were also not much different, which is approximately 5 years with an average of no genetic offspring who had type II diabetes before.

#### 3.2 Overview of the Effect of *Caesalpinia Sappan* Linn Decoction on Decreasing Blood Glucose

Table 3 shows that the decrease in blood glucose values was not only in group A (intervention) but also in group B (control) decreased blood glucose values with OHO therapy despite fluctuations in each individual. Samples have decreased blood glucose values, but each group has a different average value of decline. The average decrease in blood sugar (GD) in group A (intervention) for 7 days was 47.13 mg/dl, and the average decrease in blood sugar (GD) in group B (control) was 17.94 mg/dl, the difference in the value of the decrease in blood glucose levels between intervention group and control group showed a decrease in blood glucose levels in group A (intervention) better than group B (control).

Table 3: Effect of Caesalpinia Sappan Linn Decoction on Decrease in Blood Glucose

Intervention group				Control Group			
Sample	Blood Glucose at first day (mg/dl)	Mean blood glucose during 7 <sup>th</sup> day	Mean of decline blood glucose	Sample	Blood Glucose at first day (mg/dl)	Mean blood glucose during 7 <sup>th</sup> day	Mean of decline blood glucose
1	244	195	49	1	162	145	17
2	162	116	46	2	159	150	9
3	189	140	49	3	207	192	15
4	155	124	31	4	137	138	1
5	273	180	93	5	187	179	8
6	131	115	16	6	165	165	0
7	196	156	40	7	236	203	33
8	137	120	17	8	193	186	7
9	127	110	17	9	226	201	25
10	224	177	47	10	277	229	48
11	280	191	89	11	165	168	-3
12	238	182	56	12	126	120	6
13	233	188	45	13	130	122	8
14	191	111	80	14	230	204	26
15	155	125	30	15	225	175	50
16	203	154	49	16	206	167	39
Mean	196,12	149,00	47,13	Mean	189,47	171,50	17,94

Graphical in the below showed of changes in blood glucose from each group:

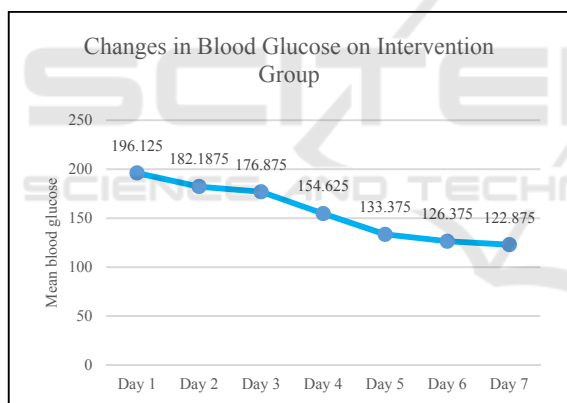


Figure 1: Changes in Blood Glucose on Intervention Group

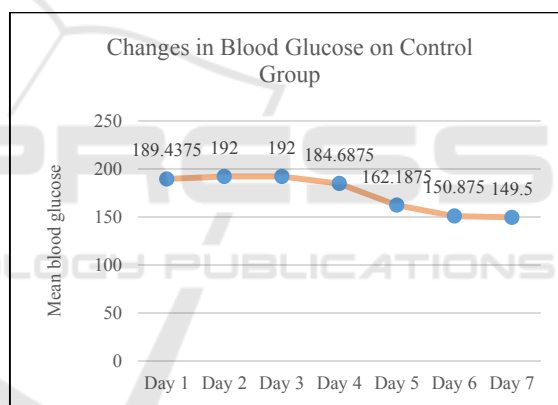


Figure 2: Changes in Blood Glucose on Control Group

Table 4: Respondent's Life Style

Intervention Group				Control Group			
Sample	Diet	Physical Activity	Drug	Sample	Diet	Physical Activity	Drug
1	Fair	Good	Good	1	Fair	Good	Fair
2	Good	Good	Fair	2	Poor	Good	Fair
3	Fair	Good	Good	3	Good	Good	Fair
4	Good	Fair	Fair	4	Fair	Fair	Poor
5	Fair	Good	Fair	5	Good	Poor	Good
6	Good	Good	Poor	6	Poor	Fair	Good
7	Fair	Good	Fair	7	Poor	Good	Good
8	Good	Fair	Poor	8	Fair	Fair	Poor
9	Fair	Fair	Poor	9	Fair	Good	Fair
10	Fair	Good	Good	10	Good	Good	Good
11	Good	Good	Good	11	Poor	Fair	Good
12	Fair	Good	Fair	12	Fair	Fair	Fair
13	Fair	Good	Fair	13	Fair	Fair	Fair
14	Fair	Good	Good	14	Fair	Good	Fair
15	Good	Fair	Fair	15	Good	Good	Fair
16	Poor	Fair	Good	16	Fair	Good	Fair

Analysis of respondents' life habits which are considered to affect the results of the study so that the sample is given an observation sheet that will be used as a process of observing various other factors besides the administration of *Caesalpinia Sappan* Linn wood (*Caesalpinia Sappan* Linn) which can affect blood sugar levels. The assessment summary of the observation sheet is by Gardner & Shoback, 2017. Table 3 shows that the living habits in both groups cannot be categorized as good, because there are still many samples found that do not consume drugs regularly and correctly, excessive consumption of food and still consume food or drinks with artificial sweeteners or added sugar.

Based on the Independent T-Test, a significance value of 0.010 was obtained. These results indicate there was a difference significantly on blood glucose level decline between the intervention group and the control group. Various factors cause the difference, those factors are as follows.

### 3.3 The Active Ingredient in the Decoction of *Caesalpinia Sappan* Linn Wood

*Caesalpinia Sappan* Linn wood has substances that help the body to help stabilize blood glucose levels so that group A has a more stable blood sugar value compared to group B. Screening results show that *Caesalpinia Sappan* Linn wood contains flavonoids, saponins, and Brazilians. Flavonoids function as natural biological response modifiers because their ability to modify the body responds to inflammatory activity due to oxidative stress in people with diabetes to stop the chain of cell damage and cell death more

quickly which can worsen the condition of sufferers (Kusmiati, Dameria, and Priadi, 2014). Saponin is used as a treatment for patients with hypercholesterolemia, hyperglycemia, antioxidants, anticancer, anti-inflammatory and antifungal. The decoction of *Caesalpinia Sappan* Linn saponin wood functions as an antioxidant and anti-hyperglycemic which can activate an increase in *hydrodynamic* activity, which helps to decrease blood glucose levels quickly (Kusmiati, Dameria, and Priadi, 2014).

Other studies have concluded that the Brazilian content of *Caesalpinia Sappan* Linn wood (*Caesalpinia Sappan* Linn) is very useful in the treatment of vascular inflammatory processes or hyperglycemia through inhibition of oxidative stress and activation of NF-kB (Nuclear Factor kB). Further studies on the determination of the Brazilian mechanism in Indonesia, the transport of glucose from adipocytes reported that Brazil caused increased transport of glucose with the help of glucose transporter (GLUT4) from intracellular to plasma membrane through activation of phosphatidylinositol 3-kinase (PI3-kinase), not by affecting protein synthesis, including GLUT4 synthesis (Nirmal *et al.*, 2015). Various contents in *Caesalpinia Sappan* Linn wood, flavonoids, saponins, and brazil are proven to control glucose levels in the blood of people with diabetes.

### 3.4 Age and Genetic

The results of the observation showed that the administration of *Caesalpinia Sappan* Linn wood stew was effective at an average age of approximately 59 years. Age above the vulnerable limit is more than

45 years (PERKENI, 2015). This result shows that supporting therapy using wood stew has a success on the body of a person with an age of approximately 59 years. A decoction of *Caesalpinia Sappan* Linn wood as support therapy can still tolerate well with someone of that age. The results of the observation showed that the administration of *Caesalpinia Sappan* Linn wood was effective at an average bodyweight of 60 kg. According to the Indonesian Endocrinology Association, a bodyweight of more than 60 kg can cause a person to have a slower tolerance to drug therapy, as well as providing supportive therapies such as herbs and *Simplicia* (PERKENI, 2015)

### 3.5 Duration of Diabetes

Respondents who experienced a significant decrease in blood sugar values were respondents who had diabetes on average for the last 2-5 years. Respondents who had diabetes more than 6 years showed a fairly good response, but have not been able to show a significant decrease in blood sugar values. This is in accordance with the theory and survey according to the Indonesian Endocrinology Association (2015), the length of time to have diabetes that is more than 10 years requires more therapy than drug administration and supporting therapy. This is because body tolerance is different compared to people who have long had diabetes (PERKENI, 2015)

### 3.6 Life Style

Other results showed that respondents who experienced a significant decrease in blood glucose values were respondents with good daily activity patterns, good sleep rest patterns, and food consumption patterns were at a fairly good level, although in terms of pharmacological therapy, require compliance was still considered poor. This is in line with the statement of the Indonesian Endocrinology Association in (2015) stating that food and beverage consumption factors, daily activities, sleep rest are the main factors in influencing blood glucose values, followed by the importance of adherence to taking medication or therapy that contributes on the stability of the condition of blood sugar levels of type II diabetics, and can prevent or delay diabetes complications continue (PERKENI, 2015)

### 3.7 Drug Choice

The results of the study found that most of the samples that experienced a significant decrease in

blood glucose values were the samples that consumed secretagogue drug class, while the samples taking combination drugs remained significantly less. This is due to the content of Brazilian, flavonoid, and saponin in the decoction of *Caesalpinia Sappan* Linn wood in general functions as a substance that helps the activity of glucose transporters to optimize the stability of blood glucose levels, which works to support the function of secretagogue drug class which functions to help and optimize insulin secretion. This is supported by research by Chinnala, Elsani, and Nalla (2015) in India who have tested the use of glibenclamide along with the administration of *Caesalpinia Sappan* Linn wood without being affected by the number of doses consumed, the results showed significant effectiveness in various doses (Chinnala, Elsani, and Nalla, 2015). This shows that the type of drug consumed can affect the reaction of the decoction of *Caesalpinia Sappan* Linn wood, and the number of doses does not affect the reaction results of the *Caesalpinia Sappan* Linn wood stew.

Based on the data and several things that have been explained, it can be concluded that the pattern of daily activities, sleep rest patterns, consumption patterns, types of medication, age factors, genetic factors, long-term diabetes, and body weight can influence the results of research and the effect of *Caesalpinia Sappan* Linn decoction. Against decreasing blood glucose levels.

## 4 CONCLUSIONS

Based on the analysis of research data and discussion, it can be concluded that the decoction of *Caesalpinia Sappan* Linn wood in accordance with the dose of each respondent in the intervention group was considered sufficient to have a significant effect on reducing blood glucose levels in the respondents during the 7 days of research that was obtained with sig values (0.010 ) <0.05, whereas in the control group the results were no better than the intervention group, by analyzing the data before and after the administration of *Caesalpinia Sappan* Linn wood stew, the intervention group experienced improved blood sugar levels better than the control group.

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