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The effect of dayak onion (Eleutherine americana L. Merr) with cinnamon (Cinnamomum burmannii) and its application as an instant drink on fasting blood sugar levels in patients with type 2 diabetes mellitus

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Abstract

Background: Diabetes Mellitus (DM) Type II is caused by impaired insulin secretion by pancreatic β cells, which experience insulin resistance, resulting in increased blood sugar levels. Instant drink Dayak onion syrup (*Eleutherine americana L. Merr*) with cinnamon (*Cinnamomum burmannii*) is predicted to reduce fasting blood sugar levels in Type II DM clients.
Purpose: Prove the effectiveness of Dayak onion syrup instant drink with cinnamon on fasting blood sugar levels in Type II DM clients.
Method: This research uses quantitative methods with a quasi-experimental design approach with a non-randomized design control group pretest and posttest design. The number of samples in this study was 36 people using consecutive sampling techniques. Each group was given intervention for 14 days, namely an instant drink of Dayak onion syrup with cinnamon at a dose of 10 ml and pharmacological drug therapy and the control group received pharmacological drug therapy. Data analysis used *the Paired-Sample T-test*.
Results: Fasting blood sugar levels in the intervention group experienced an average decrease of 20.00 mg/dL (p = 0.382) while those in the control group experienced an average increase of 8.22 mg/dL (p = 0.000). It was proven that the instant Dayak onion syrup drink with cinnamon reduced fasting blood sugar levels in Type II DM clients ($p=0.000$).
Conclusion: Instant Dayak onion syrup drink with cinnamon has been proven to be effective in reducing fasting blood sugar levels in Type II DM clients.

Keywords: Blood Sugar; Cinnamon; Dayak Onions; Diabetes Mellitus; Instant Drinks.

INTRODUCTION

Diabetes is a complex, chronic illness that requires continuous medical care with multifactorial risk-reduction strategies beyond glycemic control. Ongoing patient self-management education and support are critical for preventing acute complications and reducing the risk of long-term complications. Diabetes mellitus is classified into two types namely; type 1 (T1DM) and type 2 diabetes mellitus (T2DM) (Garedow, Jemaneh, Hailemariam, & Tesfaye, 2023). According to *the World Health Organization* (WHO) DM in the world is growing significantly from year to year, reaching 425 million people, which is predicted to continue to increase to 629 million in 2045 (Chan, 2016). Data, the prevalence of DM clients in Indonesia in 2018 was 2.0%, these results indicate an increase in the number of DM clients from the previous year which was only 1.5% (Afridah & Firdausi, 2018). Central Java is one of the provinces in Indonesia with the largest number of people experiencing DM compared to various regions in Indonesia. Data

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shows that the prevalence of clients with DM in Central Java reached 2.1% (Dewi & Susilawaty, 2019). Based on a preliminary study carried out at the Srondol Community Health Center's Service Technical Implementation Unit, 813 (May-July) Type II DM clients visited, while at the Padangdari Community Health Center there were 459 (May-July) Type II DM clients who visited.

Management of Type II DM is divided into two, namely pharmacological and non-pharmacological. Non-pharmacological management is education, physical exercise, and complementary therapy, among which there are natural biological-based therapies (Davies, D'Alessio, Fradkin, Kernan, Mathieu, Mingrone, & Buse, 2018). Non-pharmacological management of Type II DM such as complementary therapy is an important pillar in controlling blood glucose levels (Indriyani, Supriyatno, & Santoso, 2010). The high cost of medical therapy is one of the reasons why many DM clients choose to turn to affordable alternative treatments. In this current era, people need everything fast, easy, and practical. Changes in the life of an increasingly advanced society have changed the needs of people who want everything in instant form (Assalam, 2022). The advantages of instant powdered drink preparations are that they are more practical, product quality is maintained, they are not easily contaminated, they are without preservatives, they are not easily infected by disease, and they have a long shelf life (Nurayati & Adriani, 2017). In contrast, Dayak onions (*Eleutherine americana L. Merr*) and cinnamon (*Cinnamomum burmannii*) which are packaged in instant preparations will be more effective and have minimal side effects. This means encouraging the use of typical Kalimantan plants which are alternative sources for health and the ability to process these plants into products that have been proven to be efficacious. People have used Dayak onions and cinnamon since ancient times as complementary medicines, often used as alternative medicine as a substitute for anti-diabetic drugs, which are relatively expensive and used for life (Haidir, Saputri, & Hermawan, 2022).

Dayak onion bulbs contain the bioactive compound Eleutherine, which is a type of bioactive compound that is specifically only found in Dayak onion plants. All parts of the Dayak onion can be used according to their intended purpose, so this plant is often called a multifunctional plant (Febrinda, Nurwitri, & Husyairi, 2021). Dayak onions contain phytochemical substances, namely alkaloids, glycosides, flavonoids, phenolics, steroids, and tannins. This plant is used by local people as a medicine for breast cancer, hypertension, DM, and hypercholesterolemia, and to prevent stroke (Nsubuga, 2020). Dayak onions contain *flavonoids, saponins,* and *alkaloids*. Substance *flavonoid* is efficacious as a diuretic which removes several fluids and electrolytes as well as toxic substances. As an antioxidant and exogenous, *flavonoid*s are useful in preventing cell damage due to oxidative stress. The advantages of traditional medicine are that the side effects are relatively low and one plant has more than one pharmacological effect and is more suitable for metabolic and degenerative diseases (Febrinda, Astawan, Wresdiyati, & Yuliana, 2013). Cinnamon (*Cinnamomum burmannii*), is a herbal plant or spice that is often used and consumed by Indonesian people. This plant also contains chemical compounds such as selenium, essential oil safrole, eugenol, cinnamaldehyde, resin, potassium oxalate, tanners, and flavonoids (Syafriani & Verawati, 2017). Flavonoids are natural organic compounds found in roots, leaves, bark, stamens, flowers, fruit, and seeds of plants. The flavonoids contained in cinnamon can improve the performance of glucose metabolism and convert glucose into energy. This process can increase cell sensitivity to insulin so that glucose levels in the blood decrease (Fatmalia, 2018; Afridah & Firdausi, 2018).

The research results also show that Dayak onions are an anti-diabetic agent that helps prevent and protect against DM by working as an inhibitor of alpha-glucosidase (Ranti, Fatimawali, & Wehantouw, 2013). The same research on cinnamon shows that the effectiveness of cinnamon infusion can reduce blood glucose levels after intervention by giving cinnamon. Against 25 samples of DM clients (Nurayati, & Adriani, 2021). The current gap that occurs is one of the use of pharmacological drugs which have relatively slow absorption and can be extended to around 6 hours, this causes an obstacle to glucose absorption through inhibition of the *α-amylase enzyme.* and *α-glucosidase* (Syamsul, Nugroho, & Pramono, 2011). Apart from that, the gap that occurs is the use of

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Dayak onions and cinnamon in salami at different doses which statistically does result in a reduction in fasting blood sugar levels, but it has not been proven to reduce clinically, and no one has conducted research combining onions. Dayak with cinnamon. The high cost of medical therapy is one of the reasons many DM clients choose to switch to affordable alternative treatment. On the other hand, Dayak onions (*Eleutherine Americana L. Merr*) and cinnamon (*Cinnamomum Burmannii)* packaged in instant drink syrup will be more effective and have minimal side effects, so the researchers wanted to prove the effectiveness of the Dayak onion syrup instant drink with cinnamon on fasting blood sugar levels in Type II DM clients.

RESEARCH METHOD

This research uses quantitative methods with a *quasi-experimental design approach* with a *pretest* and *posttest with a control group design*. The research group was divided into an intervention group with an instant drink of Dayak onion syrup with cinnamon as much as 2x1 10 ml for 14 days and pharmacological drugs (metformin and glimepiride) and a control group with only pharmacological drugs (metformin and glimepiride) therapy according to the doctor's prescription.

The population or sample in this study were DM clients in the working area of the Public Health Center Srondol and Padangsari Semarang City. The required sample size is 32 divided into two groups, namely 16 participant group for each group. To anticipate clients *dropping out*, 10% was added so that the total sample was 36 participant. Researchers used *non-probability sampling* with a *purposive sampling method*, namely a sampling technique based on aims and objectives according to inclusion and exclusion criteria.

Inclusion criteria in this study: (a) Clients participating in PROLANIS Srondol and Padangsari Health Centers, (b) Clients aged ≥45 years, (c) Clients who do not have a history of comorbidities such as kidney failure, cardiovascular disease or mental disorders, (d) Clients in a condition of hyperglycemia Fasting Blood Sugar (FBS) ≥ 126 mg/dL – 600 mg/dL), (e) Not currently using complementary therapy and currently pregnant, (f) Willing to be a participant, while Exclusion criteria: (a) Clients are not willing to be participant, (b) The client suffers from Pancreatic Ca, Gangrenous Wounds/ulcers, (c) The client is currently on another research intervention.

In this research, several instruments will be used by researchers, namely a questionnaire containing demographic data, food recall, fasting blood glucose measurement data, a checklist for administering Dayak onion syrup with cinnamon, and *a spectrophotometer*.

Before conducting the analysis test, the research data was first collected using a data normality test. The data normality test used *Shapiro-Wilk* because the sample size was less than 50 participant. The in fasting blood sugar levels data results are $p>0.05$; this indicates that the data is normally distributed so that the *Paired T-Test* can be continued to determine the average value of group differences and *Independent T-Test* to see the differences and effectiveness of interventions before and after being given to one group or between research groups. The researcher submitted a research ethics review test to the Semarang Ministry of Health Polytechnic Research Ethics Commission with number 1130/EA/KEPK/2023.

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RESEARCH RESULTS

Table 1. Characteristics of Participants (N=36)

Variable	Intervention (n=18)	Control (n=18)	*P**
Age (Mean±SD)(Range)(Year)	(64.33±6.278) (57-73)	(64.83±5.894) (54-75)	0.713
Duration of Type 2 Diabetes (Mean±SD)(Range)(Year)	(6.44±3.807) (1-15)	(7.78±5.001) (1-20)	0.457
Gender (n/%)			
Male	8/44.4	8/44.4	1.000
Female	10/55.6	10/55.6	
Education Levels (n/%)			
Elementary School	2/11.1	0/0.0	
Junior High School	2/11.1	3/16.7	0.698
Senior High School	7/38.9	6/33.3	
University	7/38.9	9/50.0	
Occupation (n/%)			
Housewife	7/38.9	5/27.8	
Self-employed	2/11.1	4/22.2	0.324
Civil servants	9/50.0	9/50.0	
Body Mass Index (n/%)			
Underweight	0/0.0	1/5.6	
Normal	4/22.2	5/27.8	
Overweight	2/11.1	4/22.2	0.643
Obesity 1	7/38.9	8/44.4	
Obesity 2	5/27.8	0/0.0	

**Levene's Test of Homogeneity p > 0.05*

Table 1 shows that the data on the highest average age of participant is in the control group with an average age of 64.83 years, while in the intervention group, the participant have an average age of 64.33 years. The highest average duration of suffering from Type II DM among participant was in the control group with an average duration of suffering from Type II DM of 7.78 years, while in the intervention group participant suffered from Type II DM for an average of 6.44 years. Data from the majority of participant were female, namely 10 participants (55.6%) in both intervention and control groups. The majority of education levels were high school and higher education, namely 7 participants (38.9%) in the intervention group, while in the control group, namely PT with 9 participants (50.0%). The job characteristics of the majority of participant were civil servants, namely 9 participants (50.0%) in both intervention and control groups. The BMI characteristics of the majority of participant were Obesity I, namely 7 participants (38.9%) in the intervention group and 8 participants (44.4%) in the control group. The results of the homogeneity test in Table 1 are $p > 0.05$, which means the data is homogeneous or has the same variance between the two groups, namely intervention and control.

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Table 2. Fasting Blood Glucose Levels

Variable	Intervention (n=18)		Control (n=18)		*p**
	Mean±SD	Min-Max	Mean±SD	Min-Max	
Pre-test	148.44±14.610	128-179	153.33±18,289	128-183	0.146
Post-test	128.44±14.813	111-166	161.56±25.354	119-209	0.060

**Levene's Test of Homogeneity p > 0.05*

Table 2 shows that the *pre-test data* on blood sugar levels satisfied the highest average of participant in the control group with an average in fasting blood sugar levels of 153.33 mg/dL, while in the intervention group participant had an average in fasting blood sugar levels of 148.44 mg/dL. *Post-test,* the average fasting blood sugar level of participant was the highest in the control group with an average in fasting blood sugar levels of 161.56 mg/dL, while in the intervention group participant in fasting blood sugar levels was 128.44 mg/dL. The results of the homogeneity test in Table 4.2 are $p > 0.05$, which means the data is homogeneous or has the same variance between the two groups, namely intervention and control.

Table 3. Analysis of The Effect of Dayak Onion (Eleutherine Americana L. Merr) With Cinnamon (Cinnamomum Burmannii)

FBS levels	Intervention (n=18)	Control (n=18)	(Δ) Mean	t	*p**
Analysis of Changes in Fasting Blood (Mean±SD)					
Pre-test	148.44±14.610	128.44±14.813	20.00	-5.533	0.000
Post-test	153.33±18.289	161.56±25.354	+8.22	+1.638	0.120
Analysis of Differences in Fasting Blood (Mean±SD)					
Pre-test	148.44±14.610	153.33±18.289	-4.889	-0.886	0.382
Post-test	128.44±14.813	161.56±25.354	-33.111	-4.784	0.000
Analysis of Dayak Onion and Cinnamon Syrup Instant Drinks (Mean±SD)					
Effect Size	128.44±14.813	161.56±354		1.59	

**Paired T Test p <0.05*
**Cohen's Effect Test*

Table 3 shows that the results of the *paired t-test* for FBS levels in the intervention group received a *p-value* <0.05, which means that there was a significant change in FBS levels, while in the control group, they got a *p-value* > 0.05, which means that there was no significant change in FBS levels. Table 3, shows that the results of the *independent sample t-test* before (*pre-test*) giving an instant drink of Dayak onion syrup and cinnamon on in fasting blood sugar levels levels were obtained with a *p-value*> 0.05, which means there was no significant difference between in fasting blood sugar levels levels in the intervention and control groups. whereas after (*post-test*) giving an instant drink of Dayak onion syrup and cinnamon on in fasting blood sugar levels levels, it got a *p-value* < 0.05, which means there was a significant difference between in fasting blood sugar levels levels in the intervention and control groups. The results for the *pre-post-test values* in both groups showed a *p-value* <0.05, which means there was a significant difference between the pre-post-test blood sugar levels in the intervention and control groups.

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Table 3 shows that *the effect size* difference between the intervention group and the control group is very strong with a value of 1.59. This research explains that the Dayak onion syrup instant drink with cinnamon has the potential to have *an effect size* on in fasting blood sugar levels levels in Type II DM clients.

DISCUSSION

Giving an instant drink of Dayak onion syrup with cinnamon can reduce blood glucose levels in Type II Diabetes Mellitus clients and has been proven to be effective. This happens because the instant Dayak onion syrup drink with cinnamon reduces blood glucose levels and contains *flavonoids* which are natural organic compounds (Poerwosusanta, Ali, Noor, Mintaroem, & Widjajanto, 2018). *The flavonoids* contained can improve the performance of glucose metabolism and convert glucose into energy, this process can increase cell sensitivity to insulin so that glucose levels in the blood decrease (Badriyah, Agustina, & Elvierayani, 2021). The ability of *flavonoids*, especially *quercetin*, to inhibit *glucose transporter 2* (GLUT-2) in the intestinal mucosa so that it can reduce glucose absorption. This can reduce the spread of glucose and fructose from the intestine so that blood glucose levels fall. When *quercetin* was ingested with glucose, hyperglycemia was significantly reduced So *flavonoids* can have a beneficial effect in fighting DM disease both through the ability to control blood glucose levels and optimize the work of the pancreas organ (Price & Wilson, 2006).

The groups of chemical compounds found in the ethanol extract of Dayak onions and cinnamon are *alkaloids, flavonoids, glycosides, saponins, anthraquinone glycosides, tannins,* and *steroids*. The antioxidant and alpha-glucosidase inhibitor activity found in the ethanol extract of Dayak onion bulbs is greater than that found in the water extract (Nsubuga, 2020). *Alpha-glucosidase inhibitor* (AGI) is an antidiabetic agent that works by inhibiting the action of the *alpha-glucosidase enzyme*. Reducing the intestinal absorption of carbohydrates from food is a therapeutic approach for *postprandial hyperglycemia*. The combination of antioxidant capacity and the ability to inhibit the alpha-glucosidase enzyme found in Dayak onions shows that Dayak onions have potential as an antidiabetic which is useful in preventing and protecting (*Prophylaxis*) against DM. (Syafriani & Verawati, 2018).

The role of flavonoids and alkaloids as hypoglycemic agents works through two main mechanisms, namely intra-pancreatic and extra-pancreatic. *Alkaloid* and *flavonoid* compounds in the intra-pancreatic mechanism work by repairing (regenerating) damaged pancreatic β-cells protecting β-cells from damage and stimulating the release of insulin (Aslamiyah, Anastasia, & Luliana, 2019). *Alkaloids* are proven to have regenerative abilities whereas *alkaloid extracts* are proven to have the ability to regenerate damaged pancreatic β-cells. *Alkaloids* are also able to stimulate the sympathetic nerves (sympathomimetic) which has the effect of increasing insulin secretion (Setyawan & Masnina, 2018). *Flavonoids* have antioxidant properties that can protect against damage to pancreatic cells by free radicals (Fatmalia, 2018).

Dayak onion bulbs contain alkaloids, flavonoids, saponins, terpenoids, steroids, glycosides, tannins, phenolics, and anthraquinones. The chemical compounds contained in the ethanol extract of Dayak onion bulbs are alkaloids, flavonoids, glycosides, saponins, anthraquinone glycosides, tannins, and triterpenoids/steroids. The chemical compounds contained in the ethyl acetate fraction are phenolic compounds, tannins, and flavonoids (Badriyah et al., 2021). *Alpha Glucosidase Inhibitor* (AGI), is an antidiabetic agent that works by inhibiting the action of the alpha-glucosidase enzyme. Reducing the intestinal absorption of carbohydrates from food is a therapeutic approach for postprandial hyperglycemia. Complex polysaccharides will be hydrolyzed by the amylase enzyme into dextrin and further hydrolyzed into glucose by the alpha-glucosidase enzyme before entering the blood circulation through epithelial absorption. Synthetic amylase and alpha-glucosidase inhibitors, such as acarbose, have been widely used to treat clients with type II diabetes, but these drugs have also been reported to cause various side effects. In this regard, many efforts have been made to find AGI from natural sources to treat diabetes (Dalimunthe, & Silalahi, 2021).

In this study, pharmacological drug therapy was given; non-pharmacological treatment can be given as a support system, not as an alternative substitute

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to replace the primary treatment, but in this case as a complementary therapy for Type II DM clients, because this herbal therapy must still be under research development. Health, especially Dayak onion syrup with blood cinnamon, which is given, can reduce fasting glucose levels in Type II DM clients with a reabsorption process that is absorbed more quickly by the body because the small particle size can penetrate the surface of cell walls quickly and precisely. The mechanism of the Dayak onion syrup instant drink with cinnamon towards reducing fasting blood sugar levels is that it contains flavonoids, which are natural organic compounds. The flavonoids in it can improve the performance of glucose metabolism and convert glucose into energy; this process can increase cell sensitivity to insulin so that glucose levels in the blood decrease. Flavonoids, especially quercetin, can inhibit glucose transporter 2 (GLUT-2) in the intestinal mucosa to reduce glucose absorption. This can reduce the spread of glucose and fructose from the intestine, so blood glucose levels fall. When quercetin is ingested with glucose, hyperglycemia is significantly reduced (Dalimunthe, & Silalahi, 2021). So, flavonoids can have a beneficial effect in fighting DM through the ability to control blood sugar levels and optimize the work of the pancreatic organ.

CONCLUSION

There was a difference in fasting blood sugar levels in the intervention group before and after the intervention treatment in fasting blood sugar levels. Hence, the instant Dayak onion syrup drink with cinnamon with a 2x1 dose of 10 ml for 14 days effectively reduced in fasting blood sugar levels in Type II DM clients.

REFERENCES

Afridah, W., & Firdausi, N. J. (2018, May). Waspada Diabetes Melitus Analisis Perilaku Berisiko Pada Peningkatan Kasus Diabetes Melitus Di Indonesia. In *Prosiding Seminar Profesi Kesehatan Masyarakat* (pp. 132-137). Persakmi.

Aslamiyah, N. A. A., Anastasia, D. S., & Luliana, S. (2019). Metode-metode pembuatan minuman serbuk instan. *Jurnal Mahasiswa Farmasi Fakultas Kedokteran UNTAN*, *6*(1).

Assalam, S. (2022). Optimasi Formula Minuman Rempah Serbuk Instan Menggunakan Design Expert Metode Mixture D-Optimal. *Pasundan Food Technology Journal (PFTJ)*, *9*(1), 25-31.

Badriyah, N., Agustina, N., & Elvierayani, R. R. (2021). Pelatihan Pembuatan Minuman Herbal Bawang Merah Dayak sebagai Produk Unggulan Lokal di Desa Mojoasem Kecamatan Laren Kabupaten Lamongan. *Community Engagement and Emergence Journal (CEEJ)*, *2*(1), 64-68.

Chan, M. (2016). Global report on diabetes. *World Health Organization*, *58*(12), 1-88.

Dalimunthe, I., & Silalahi, K. L. (2021). Efektivitas seduhan hangat kayu manis terhadap penurunan kadar gula darah pada penderita Diabetes Mellitus. *Jurnal Keperawatan*, *19*(1), 10-17.

Davies, M. J., D'Alessio, D. A., Fradkin, J., Kernan, W. N., Mathieu, C., Mingrone, G., & Buse, J. B. (2018). Management of hyperglycemia in type 2 diabetes, 2018. A consensus report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetes care*, *41*(12), 2669-2701.

Dewi, R., & Susilawaty, S. A. (2019). Efektivitas senam aerobik terhadap kontrol kadar glukosa darah pada pasien dm tipe 2. *Jurnal Ilmiah Keperawatan Imelda*, *5*(2), 91-95.

Fatmalia, N. (2017). Pengaruh konsumsi kayu manis terhadap glukosa darah penderita diabetes mellitus di tambak ploso lamongan. *Journals of Ners Community*, *8*(1), 106-111.

Febrinda, A. E., Astawan, M., Wresdiyati, T., & Yuliana, N. D. (2013). Kapasitas Antioksidan Dan Inhibitor Alfa Glukosidase Ekstrak Umbi Bawang Dayak [Antioxidant and Alpha-Glucosidase Inhibitory Properties of Bawang Dayak Bulb Extracts]. *Jurnal Teknologi dan Industri Pangan*, *24*(2), 161-161.

Febrinda, A. E., Nurwitri, C. C., & Husyairi, K. A. (2021). Aktivitas Antioksidan Dan Preferensi

Farihatun Nisa*, Sudirman, Walin, Supriyadi, Budi Widiyanto

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DOI: https://doi.org/10.33024/minh.v7i2.241

Konsumen Pada Minuman Fungsional Berbasis Umbi Bawang Dayak. *Jurnal Sains Terapan: Wahana Informasi dan Alih Teknologi Pertanian*, *11*(2), 11-19.

Garedow, A. W., Jemaneh, T. M., Hailemariam, A. G., & Tesfaye, G. T. (2023). Lifestyle modification and medication use among diabetes mellitus patients attending Jimma University Medical Center, Jimma zone, south west Ethiopia. *Scientific reports*, *13*(1), 4956.

Haidir, Y. P., Saputri, G. A. R., & Hermawan, D. (2022). Uji efektivitas kombinasi bawang dayak (*Eleutherine palmifolia (l.) Merr*) dan daun insulin (*Tithonia diversifolia*) terhadap penurunan kadar glukosa darah pada tikus putih (*Rattus norvegicus*) diinduksi Na2EDTA. *Jurnal Farmasi Malahayati*, *5*(1), 86-97.

Indriyani, P., Supriyatno, H., & Santoso, A. (2010). Pengaruh latihan fisik; senam aerobik terhadap penurunan kadar gula darah pada penderita DM tipe 2 di wilayah Puskesmas Bukateja Purbalingga. *Nurse Media Journal of Nursing*, *1*(2).

Nsubuga, C. (2020). *Staff Education on American Diabetes Association Standards of Medical Care for Diabetes* (Doctoral dissertation, Walden University).

Nurayati, L., & Adriani, M. (2017). Hubungan aktifitas fisik dengan kadar gula darah puasa penderita diabetes melitus tipe 2 association between physical activity and fasting blood glucose among type 2 diabetes mellitus patients. *CC BY SA*, 80-87.

Poerwosusanta, H., Ali, M., Noor, Z., Mintaroem, K., & Widjajanto, E. (2018). Potensi Ekstrak Bawang Dayak (Eleutherine Sp) sebagai Obat Herbal Terstandar (OHT) pada Pengobatan Medis. *Jurnal Ilmiah Ibnu Sina*, *3*(2), 242-251.

Price, S. A., & Wilson, L. M. (2006). Patofisiologi konsep klinis proses-proses penyakit. *Jakarta: Egc*, *4*(2), 1127-1128.

Ranti, G. C., Fatimawali, F., & Wehantouw, F. (2013). Uji efektivitas ekstrak flavonoid dan steroid dari Gedi (abelmoschus manihot) sebagai anti obesitas dan Hipolipidemik pada tikus putih jantan galur wistar. *Pharmacon*, *2*(2).

Setyawan, A. B., & Masnina, R. (2018). Efektivitas Teh Bawang Dayak untuk Menurunkan Kadar Gula Darah Pasien Diabetes Mellitus Tipe 2. *Strada Jurnal Ilmiah Kesehatan*, *7*(2), 7-13.

Syafriani, S., & Verawati, B. (2017). Pengaruh ekstrak kayu manis terhadap penurunan kadar gula darah pada penderita dm tipe ii di Desa Kumantan wilayah kerja Puskesmas Bangkinang Kota. *Jurnal Ners*, *1*(2).

Syamsul, E. S., Nugroho, A. E., & Pramono, S. (2011). Aktivitas Antidiabetes Kombinasi Ekstrak Terpurifikasi Herba Sambiloto (Andrographis paniculata (Burn. F.) NESS.) dan Metformin pada Tikus DM Tipe 2 Resisten Insulin. *Majalah Obat Tradisional*, *16*(3), 124-131.

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