# *Gymnema sylvestre* extract as a Traditional Medicine For Diabetes Mellitus

[1]Arum Kusuma Putri, S.Tr.Kes., M.Kes, [2]Yulia Ratna Dewi, S.Tr.A.K., M.Biomed
[12]Sarjana Terapan Teknologi Laboratorium Medis, Politeknik Indonusa Surakarta
[1]parumkusuma@gmail.com [2]yuliaratnadewi@politeknikindonusa.ac.id

**ABSTRACT**

Diabetes Mellitus (DM) is a metabolic desease characterized by hyperglycemia and resulting in impaired insulin resistance (Lila *et al.,* 2023; Kashif *et al.,* 2023). According to the World Health Organization (WHO), in 2019 DM cases with a prevalence of 1.5 million deaths and 48% occurred before the age of 70 years. Indonesia is in seventh position with 10.7 million DM cases and will continue to increase until 2045 (WHO, 2019). Diabetes mellitus sufferers prefer herbal medicine because it is cheap, easy to buy, safe, does not cause side effects, and contains natural ingredients (Hamzah, 2019). *Gymnemwa sylvestre* (*G. sylvestre*) is a plant found in central and western India, Africa and Australia. This plant is an anti-diabetic plant that has been used for centuries as a traditional medicine (Khan *et al*., 2019). Gymnemwa sylvestre is a plant found in central and western India, Africa, Australia, and grows in tropical countries such as Indonesia, China, Malaysia (Kashif *et a*l., 2023). This plant is a traditional medicine that has been used for centuries as an antidiabetic (Khan *et al*., 2019).

Research purposes is to determine the effect of *Gymnema sylvestre* extract as an antidiabetic in experimental animals treated with diabetes mellitus (DM). The type of research carried out was a journal review.

The results of the research were that *Gymnemwa sylvestre* extract doses 120, 200, 250, 400, 500, 900mg/kg were injected into experimental animals of rats or rabbits treated for diabetes mellitus. Blood samples were examined for lipid profiles (total cholesterol, LDL, HDL, triglycerides) with the results showing a significant reduction, so that *G.sylvestr*e extract was able to reduce hyperglycemia.

*Keyword* : Diabetes Mellitus, *Gymnema sylvestre*, Lipid Profile

## INTRODUCTION

Diabetes mellitus (DM) is a disease when the body cannot produce enough insulin for a long time, causing blood glucose levels to increase. DM is a metabolic disease characterized by hyperglycemia which results in impaired insulin resistance and insulin sensitivity resulting in changes in carbohydrate, protein and lipid metabolism (Kashif *et al*., 2023).

In 2019, the World Health Organization (WHO) caused 1.5 million deaths and 48% occurred before the age of 70 years. As many as 460,000 deaths due to kidney disease are caused by diabetes and 20% of deaths due to cardiovascular disease due to increased blood glucose. Indonesia is in seventh position with 10.7 million DM cases and will continue to increase until 2045 (WHO, 2019).

The Ministry of Health of the Republic of Indonesia (KEMENKES) in 2023 stated that diabetes prevalence data reached 10.9% in 2018 and reached 11.7% in 2023. The increase in DM occurred in the productive age of 18-59 years and elderly people over 60 years (KEMENKES, 2023 ). DM sufferers often occur in the productive age group, so it can influence social factors, one of which is health problems (Brady *et al*., 2022).

Diabetes mellitus causes a metabolic disorder characterized by hyperglycemia that causes defects in insulin secretion, defects in insulin action or both. Untreated diabetes causes serious complications or even death (Hamzah, 2019). Type 2 diabetes mellitus is the most common at 95% compared to type 1. In the case of type 1 DM the body fails to produce insulin, while in type 2 the body shows resistance to insulin (Ramachandran *et al*., 2014).

Diabetes mellitus occurs because insulin production and the way insulin works are disrupted resulting in consistently high blood sugar levels and resulting in disruption of the body's way of processing carbohydrates, lipids and proteins (Mandal *et al*., 2024).

Treatment of diabetes mellitus is based on insulin or oral hypoglycemic drugs. These drugs work through various mechanisms to control blood glucose levels. DM sufferers prefer herbal treatment because it is cheap, easy to buy, safe, has no side effects, and contains natural ingredients (Hamzah, 2019).

Herbal medicines come from plant materials, animal materials, mineral materials, extract preparations (herbal medicines) or mixtures of these materials and are used for generations for treatment based on experience or a formulation (Astuti *et al*., 2022).

There are more than 1200 plant species that can treat diabetes mellitus. One of them is the *Gymnema sylvestre* plant which is native to central India, west India, Africa and Australia. This plant is an anti-diabetic plant that has been used for centuries as a traditional medicine (Khan *et al*., 2019).

G. *sylvestre* is grown in tropical countries such as India, China, Indonesia, Japan, Malaysia, Sri Lanka, Vietnam and South Africa. This plant is also known as *Madhunashini, Gurumalbuti* and *Meshringi*. *Gymnema* (Gurmar) means leaves that suppress sweetness and has been used for more than 2000 years (Kashif *et al*., 2023). G. sylvestre is a woody plant from the Azclepiadaceae family and contain bioactive elements (*gymnemagenol, gymnemic acid, gymnomosides, gurmarin, and gymnemanol*) (Lui *et al.*, 2021).

The benefits of *Gymnema sylvestre* can reduce blood sugar levels, because the gurmar plant is able to absorb glucose and prevent blood sugar levels from being high after eating. Inhibits the desire to consume sweet foods/drinks, because the gurmar plant has gymnemic acid which can inhibit sugar receptors in the taste buds. Stimulates insulin production by stimulating pancreatic cells to produce insulin (Laha&Paul, 2019).

Research that has been carried out on the G. sylvestre plant by isolation and purification states that gymnemic acid and gymnema saponin molecules

are anti-diabetic (Harshavardhana *et al.*, 2019).

G. Sylvestre leaves contain gymnemic acid so they can reduce hyperglycemia. The mechanism that occurs is increased enzyme activity in glucose utilization, increased phosphorylation, decreased enzyme activity in glyconeogenesis and sorbitol dehydrogenase, and reduced glucose absorption in the intestine (Beula *et al*., 2023).

**RESULTS AND DISCUSSION**

Research title "Gymnema Sylvestre Supplementation Restores Normoglycemia and Corrects Dyslipidemia through Transcriptional Modulation of ßeta Cells and Hepatocytes in the Alloxan-Induced Hyperglycemic Rats" with the results of G. sylvestre capsules at a dose of 250mg/kg and 500mg/kg being injected into hyperglycemic adult rats for 21 days with the results of lipid profile levels (LDL, triglycerides, and total cholesterol), ALT, and AST reducing significantly. The effect of G. sylvestre on insulin gene transcription improves dyslipidemia caused by hyperglycemia through hepatocyte transcription (Muzaffar *et al*., 2022).

Extracts of G. sylvestre and Trigonella foenum-greecum were injected into 30 diabetic rabbits grouped into six (positive control, negative control, GS treatment and M treatment with a dose of 300mg/kg G. sylvestre, 500mg/kg metformin for 4 weeks. Carried out examination of fasting blood sugar with results of a significant reduction in diabetic rabbits with a hypoglycemic effect. Research title "Unlocking the anti-diabetic potential of Gymnema sylvestre, Trigonella foenum-graecum, and their combination thereof: An in-vivo evaluation" (Kashif *et al*. , 2023).

The research "An Assessment of Anti-diabetic Effect of Gymnema sylvestre in Alloxan-induced Rat Model" with anti-diabetic results in G. sylvestre extract at a dose of 900 mg/kg which was injected into 50 male Wistar rats weighing 125-500 grams. Lipid profile examinations were carried out (cholesterol, HDL, LDL, triglycerides), SGPT, SGOT which showed significant results. G. sylvestre extract can help protect against diabetes, high cholesterol, liver damage and poor kidney function even though it has anti-diabetic and anti-hyperlipidemia properties (Mandal *et al*., 2024).

Capsules containing G. sylvestre extract at doses of 200 and 400 mg/kg were injected into diabetic mice and their lipid profile, VLDL, body weight and plasma insulin were examined. The results of 200 mg/kg G. sylvestre extract were more significant than 400 mg/kg, so that a dose of 200 mg/kg had anti-hyperglycemic and anti-hyperlipidemic activity in the study "Antihyperglycemic and anti-hyperlipidemic effect of biologically synthesized silver nanoparticles and G. sylvestre extract on Streptozotocin induced diabetic rats-an in-vivo approach" (Shanker *et al*., 2017).

Research entitled "Anti-obesity Effect of Gymnema sylvestre Extract on High Fat Diet-induced Obesity in Wistar Rats" resulted in G. sylvestre leaves being extracted at a dose of 120 mg/kg, then injected into male Wistar rats weighing 150- 200 grams for 21 days. A lipid profile examination was carried out (triglycerides, total cholesterol, LDL, HDL), insulin, glucose, apolopoprotein

A1 and B. The results showed that the examination showed a significant decrease in triglycerides, total cholesterol, LDL, HDL, insulin, glucose, apoliporprotein B (Kumar *et al*., 2013).

The research title is "Pharmacological Evaluation of "Sugar Remedy," A Polyherbal Formulation, on Streptozotocin Induced Diabetes Mellitus in Rats" with results from rats treated for diabetes mellitus and fasted overnight. Injecting G. sylvestre extract at a dose of 16.7 grams resulted in a more effective reduction in blood glucose levels (Singhal *et al*., 2014).

Gymnema sylvestre capsules consumed by 32 type II diabetes patients aged 30-60 years for 30 days significantly decreased glucose levels. Data shows that 1 gram dose of Gymnema sylvestre reduces glucose 37%, triglycerides 7%, cholesterol 13%, HDL 2%, and LDL 19% in the study "Effect Of Gymnema Sylvestre, Citrullus Colocynthis, And Artemisia Abisinthum On Blood Glucose And Lipid Profile In Diabetic Human" (Youshan Li *et al*., 2015).

## CONCLUSION

Based on the results of analysis from various research journals, it can be concluded that Gymnema sylvestre extract has great potential as a diabetes treatment because it can reduce hyperglycemia. The mechanism of action includes increasing the activity of enzymes involved in glucose utilization, increasing phosphorylation, and decreasing the activity of enzymes involved in gluconeogenesis and sorbitol dehydrogenase. Apart from that, gymnemic acid is also able to reduce or delay glucose absorption in the intestine.

## BIBLIOGRAPHY


Astuti. Yuli, Nova Riani, Neneng Elviana. (2022). "Edukasi Pengenalan Obat Herbal Untuk Penyakit Diabetes Mellitus Di Wilayah Kelurahan Pondok Ranggon." *Jurnal Medika Hutama*, 3(3): 2762-2771.

Beula. S.J, Suthakaran. R, Viswaja. M, Shankar. CH. (2023). Anti-diabetic effect of Gymnema sylvestre an Alloxan-Induced Diabetic in Male Albino Wistar Rats. Asian Journal of Pharmacy and Technology. DOI:10.52711/2232-5713.2023.00007

Brady. Elise, C. Michele, W. Richard, G. Michael, A. Olufunke, C. Lumbwe. (2022).

Hamzah, D.F. (2019)."Analisis penggunaan obat herbal Pasien Diabetes Mellitus Tipe II Di Kota Langsa."*JUMANTIK*4(2):168 –177. http://dx.doi.org/10.30829/jumantik.v4i2.5057

Harshavardhana. Hassan R, and Krishna. Mysore S. (2019). Protective role of Gymnema sylvestre leaf extract on high sucrose diet-induced diabetic like phenotype, oxidative stress, reproductive fitness and longevity in Drosophila melanogaste. 5(3):535-546. DOI:10.31024/ajpp.2019.5.3.15

Kashid. M, Nasir. Amar, Gulzaman. Rafique. Kamran Muhammad, Abbas. Mazhar, Rehman. Aziz, Riaz. Muhammad, Rasool. Ghulam,Andrew G. Mtewa. *Unlocking the anti-diabetic potential of Gymnema sylvestre, Trigonella foenum-graecum, and their combination thereof: An in-vivo evaluation*. (2023) Malawi University of Science and Technology. Limbe, Malawi. DOI: 10.1002/fsn3.3685

Kashif, Muhammad, Amar Nasir, Gulzaman, Muhammad Kamran Rafique, Mazhar Abbas, Aziz ur Rehman, Muhammad Riaz, Ghulam Rasool, and Andrew G. Mtewa. (2023). "Unlocking the Anti-Diabetic Potential of Gymnema Sylvestre, Trigonella Foenum-Graecum, and Their Combination Thereof: An in-Vivo Evaluation." *Food Science and Nutrition* 11(12):7664–72. https://doi.org/10.1002/fsn3.3685.

Kementrian Kesehatan RI (KEMENKES). (2023). Diabetes Fakta dan Angka. https://p2ptm.kemkes.go.id/uploads/2016/11/Diabetes-Fakta-dan-Angka.pdf

Khan, F., Sarker, M. M. R., Ming, L. C., Mohamed, I. N., Zhao, C., Sheikh, B. Y., Tsong, H. F., & Rashid, M. A. (2019). "Comprehensive review on phytochemicals, pharmacological and clinical potentials of Gymnema sylvestre." *Frontiers in Pharmacology*, 10, 1223:1-19. https://doi.org/10.3389/fphar.2019.01223.

Kumar V. Bhandari. Tripathi. G. Khanna. Anti-obesity Eff ect of Gymnema sylvestre Extract on High Fat Diet-induced Obesity in Wistar Rats. 2013. Department of Pharmacology KIET School of Pharmacy, New Delhi, India. DOI : http://dx/doi/org/10.1055/s-0033-1349852

Laha. Suparna, and Santanu Paul. (2019). "Gymnema Sylvestre (Gurmar): A Potent Herb with Anti-Diabetic and Antioxidant Potential." Pharmacognosy Journal 11(2):201–6. doi: 10.5530/pj.2019.11.33.

Liu M, Zhou T, Zhang J, Liao G, Lu R, Yang X. Identification of C21 Steroidal Glycosides from Gymnema sylvestre (Retz.) and Evaluation of Their Glucose Uptake Activities. [published correction appears in Molecules. 2022 Sep 05;27(17):]. Molecules. 2021;26(21):6549. doi:10.3390/molecules26216549

Mandal, Kumar Souvik. Rahmat, Sara. Sakib, Kazi. Mehjabin, Bornila. Rahman, Tasnia. Rasna, Israt Jahan. (2024). Dhaka, Bangladest. https://www.sdiarticle5.com/review-history/112298

Muzaffar. Humaira, Qamar. Iqra, Bashir. Muhammad, Farhat. Jabeen, Irfan. Shahzad, Anwar. Haseeb. (2022). *Gymnema sylvestre Supplementation Restores Normogltxemia and Corrects Dyslipidemia through Transcriptonal Modulation of Beta Cells and Hepatocytes in the Alloxan-induced Gyperglycemic Rats*. University Faisalabad, Pakistan. doi:10.20944/preprints202212.0526.v1

Ramachandran.A, C. Snehalatha, and R. C. W. Ma. (2014). "Diabetes in South-East Asia: an update." *Diabetes Research and Clinical Practice*. 103 (2): 231–237. doi: 10.1016/j.diabres.2013.11.011

Shanker., K, G. Krishna Mohan, V. Mayasa, L. Pravallika, Efek antihiperglikemik dan anti-hiperlipidemik dari nanopartikel perak yang disintesis secara biologis dan ekstrak G. sylvestre pada Streptozotocin menginduksi tikus diabetes-sebuah pendekatan in-vivo , Materials Letters (2017), http://dx.doi.org/10.1016/j.matlet.2017.02.137

Singhal, S., Singh, R.A., Lohar, V., Dave, R., Dave, J. (2014). "Pharmacological Evaluation of "Sugar Remedy," A Polyherbal Formulation, on Streptozotocin-Induced Diabetic Mellitus in Rats. Journal Of Traditional and Complementary Medicine." 4(3) : 189-195. http://www.jtcm.org.

World Health Organization (WHO).(2019). Classification of Diabetes Mellitus.

Youshan Li., Zheng, M., Zhai, X., Huang, Y., Khalid, A., Malik, A., Shah, P., Karim, S., Azhar, S., Hou, X. (2015). "Effect Of Gymnema Sylvestre, Citrullus Colocynthis, And Artemisia Abisinthum On Blood Glucose And Lipid Profile In Diabetic Human." *Journal of Acta Poloniae Pharmaceutica*. 72 (5) : 981-985