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Insights into Some Medicinal Plants towards Anti-Diabetic Potential: A Recent Developments

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ABSTRACT: In past few decades, there has been a growing development in the area of phytochemical medicine and gaining fame in well developing and developed nations because of their natural emergence and lesser side effects. This well-organized study was directed the information about medicinal herbs used for the treatment of diabetes mellitus (DM) in both type-1 and type-2. DM is a metabolic disorder of the endocrine system and affecting nearly 10% of the population around the word also the number of those affected is growing day by day. This review presented information about the scientific name, plant parts and uses against multiple disease of medicinal plants. The large number of plants described in this review clearly demonstrated the importance of herbal plants in the treatment of diabetes. The effects of these plants may delay the development of diabetic complications and correct the metabolic abnormalities. This work will help the researchers for further study on the potential use of medicinal herbs having antidiabetic action.

KEYWORDS: Diabetes mellitus, natural sources, phytochemicals

INTRODUCTION

DM it is one of the oldest disorders known to human being. It is a metabolic disease usually characterised by a raise of the blood glucose levels. Pancreatic beta cells (β -cells) produce the hormone know as insulin which facilitates the absorption of glucose into the cells concern to provide energy as well as in a variety of additional functions. Diabetes mellitus occurs due to a lack in the insulin synthesis or production [1]. It is mainly classified in two common types such as type 1 and type 2 diabetes mellitus. Type 1 DM (T1DM) is related with failure in insulin production resulting from the destruction of pancreatic β -cells by T-cell-mediated autoimmunity [2]. While, type 2 DM (T2DM) is associated with insulin resistance and decrease of insulin production. Higher mortality was found in T1DM compared to type-2 due to high incidence of cardiovascular conditions and severe metabolic disorders [3]. It is very important that all forms of DM to be diagnosed and managed at the early period to avoid reduction in its complications including diabetic nephropathy, retinopathy, cardiovascular diseases and neuropathy [4-6]. Diabetes mellitus is an extensive socioeconomic burden to many well-equipped and developed countries, scientific community and researchers paly a very important role in discovery and development new chemical entities for management of antidiabetic drugs [7-10]. Nowadays, therapeutics including, gastric inhibitory peptide (GIP), amylin analogues, incretin mimetics, peroxisome proliferator activated receptor (PPAR) and dipeptidyl peptidase-4 (DPP4) inhibitors are significantly used in treatment of diabetes mellitus [11-14]. Moreover, around 800 herbal species have also been reported to possess antidiabetic potential. Some of plant species also used for treatment of diabetes by the Americans, Chinese, South Americans and Asian Indians [15-20]. The study disclosed that Asian and African lands have 56% and 17% contribution in worldwide distribution of therapeutically useful herbal plants, respectively [21-22]. Biological potential of the plants species is depending on chemical composition that are rich in flavonoids, phenolics, coumarins, alkaloids, terpenoids and glycosides usually demonstrate encouraging results. However, some of conventional drugs such as metformin used in treatment of DM have a plant origin [23-24]. The marketed conventional drugs work by improving insulin sensitivity, enhances insulin production and reduces the amount of glucose in blood. The adverse effect of drug treatment is not

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always pleasing in maintaining normal levels of blood glucose and this view many medicinal herbs have been provided an important source of antidiabetic principle which are widely used in management of diabetes mellitus in various traditional system of medicine globally and many of them are recognized to be beneficial against diabetes [25-27]. In recent time, there has been a growing attention in the herbal medicine in prevention and management of diabetes both in well developing and developed nations, due to their natural origin and lesser adverse events [28,29]. Some of important chemical constituents showing potential anti-diabetic potential [30] displayed in (**Figure 1**).

In this compressive survey we try to attempt compilation of hypoglycemic herbs published in different scientific journal from various database such as Google Scholar, PubMed, SciFinder, NCBI which will be useful for heath professional, research group and scientist working in the area of pharmacology and therapeutics to discover alternative medicine form plants sources to cure and management of diabetic mellitus (**Table 1**).



Figure 1: Potential chemical constituents exibited anti-diabetic profile.

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Table 1: List of Medicinal herbs having anti-diabetic potency.

Medicinal herbs	Part used	Medicinal Uses	References
Origanum vulgare	Leaves/ Flower	Regulate blood sugar & lipid, cold	
Hypericumperforatum	Seed	Hypertension, antioxidants prevent aging	
Helichrysum	Flower	Anti-lipid, peroxidation, cardiotonic,	
rubicundum		hypotensive, antidegenerative, anti-	
		diabetes	
Hippophaerhamnoides	Leaves	Antidiabetic, diarrhea and Excessive menstruation	[31]
Chamomillaerecutita	Leaves	Diarrhea, excessive menstruation and antidiabetic	
Melilotus officinalis	Leaves	Hypertension, antioxidants prevent aging, arteriosclerosis	
Zea mays	Kernels	Anti-diabetes, Arthritis, anxiety, sleeping trouble, anti-diabetes	
Rubuscaesius	Leaves	Antidiabetes Blood Disorder	
Rubuseuesius		Respiratory Disorder, Piles	
Azadirachta indica	Azadirachta indica	Arthritis, anxiety, trouble sleeping, anti-	[32]
		diabetes	[0-]
Berberis aristata	Bark	Arthritis, anxiety, trouble sleeping, anti-	[33,34]
		diabetes	
Physalis angulata L.	Leaves	Peroxidation, cardiotonic, hypotensive,	[35]
		anti-diabetes	
Aspergillus oryzae	Tetrahydroxyisoquinoline derivative (WYK-1)	Antidiabetic and used as food	[36]
Castanospermum	Seed	Anti-diabetes, Arthritis, anxiety, trouble	[37]
australe		in sleeping	
Aloe barbadensis	Leaves	Anti-diabetic, anti-microbial, anti-ulcer,	[38]
Citation		Anti-cancer.	[20]
Citrus sinensis	Fruit Peel	antionadetic anti-initammation&	[39]
Phalarisconariansis	Seed	Hyperglycemia Hypertension	[40]
1 Halai iseanai tensis	Seed	antioxidants and arteriosclerosis	[40]
Amaranthus	Seed	Excessive menstruation and diarrhea.	[41]
hypochondriacus		antidiabetic	[]
Terminalia arjuna	Bark	Cardiotonic, anti-diabetic, Anti-	
-		dysenteric, anti-pyretic	
Emblica officinalis	Fruits	Antioxidant, antidiabetic, anti-	
		inflammation,	
Commiphora mukul	Gum-resin	Anti-inflammation, antidiabetic	[42-44]
Morinda citrifolia	Fruits	Anti-diabetic, anti-depression, anxiety	
Gymnema sylvestre	Leaves	Anti-diabetic, lower blood pressure and	
Camellia sinensis	Leaves	Antidiabetic Hypertension antioxidants	[45]
Camenia sinclisis	Leaves	nrevent aging arteriosclerosis	[43]
Lagerstroemia loudonii	Leaves	Hypertension, antioxidants	
Origanum vulgare	Leaves	Hypotension, anti-degenerative, anti-	[46]
8		diabetic	[]
Menthapiperita	Leaves	Anti-diabetic, anti-cancer, anti-microbial,	
		antiemetic	
Abelmoschus esculentus	Fruits	Anti-diabetic, diuretic, Anti-spasmodic,	[47]
Rheum palmatum	Roots	Fever and edema, anti-inflammatory,	
		antidiabetic	
Caesapinia sappan	Heartwood	Antioxidant, anti-inflammatory, hepatoprotective, antidiabetic	

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Psidium guajava	Leaves	Treatment for diarrhea, dysentery, pain relief, Anti-diabetic, hypertension	
Cinchona officinalis	Stem bark	Increase juice, increase production of digest, shows hyperglycemic inhibitions	
Phyllanthns niuri	Aerial parts	Management of liver disease, anti- cancer, anti-diabetic, anti-hypertensive	[48]
Elephantopusscaber	Roots	Treatment edema, fever, pain, cold cough and diabetes	
Morus nigra	Stem bark	Anti-bacterial, anti-diabetic, hypertension	
Muntingiacalabura	Leaves	Antidiabetic, Antispasmodic, headache, cold cough	
Foeniculum vulgare	Seeds	Treatment for respiratory, blood pressure, digestive problem diuretic.	
Vernania amygdalina	Leaves	Anti-diabetic, anti-malaria, kidney disease, anti-hypertensive	
Ziziphusmauritiana	Root	Anti-diabetic, Anti-cancer, anti- microbial, hepatoprotective, cardioprotective, antiemetic	[49,50]
Arachishypogaea	Seed	Anti-diabetes, Anti-lipid, peroxidation, cardiotonic, hypotensive, antidegenerative,	
Solanum incanum	Fruit	Arthritis, anxiety, trouble sleeping, anti- diabetes	
Senna nigricans	Leaves	Skin irritations, anti-diabetes, ulcers	
Trigonella foenum	Seed	Reproductive or sin problems, antidiabetic and ulcers.	[51]
Withania somnifera	Root powder	Anxiety, sleeping problem, antioxidant, anti-diabetic	
Ocimum sanctum	Leaves	Anti-cancer, heptoprotective Anti- diabetic, anti-microbial, and cardio- protective	[52]
Momardica charantia	Fruits	Respiratory and blood disorder, Anti- diabetic, piles, antioxidant.	
Mangifera indica	Leaves	Antioxidant, cardiotonic, hypotension, anti-diabetic	[53]
Prosopis cineraria	Pod	Used in asthma, bronchitis skin problem, antidiabetic	[54]
Garlic bulb	Bulb	Antioxidant, anti-hypertensive, anti- inflammatory, anti-diabetic.	[55]
Butea monosperma	Fruit	Type II diabetic patient	[56]
Ziziphus spinachristi	Leaf	Reduces glucose level	
Tremella mesenterica	Fruit	Reduces glucose level	[57]
Terminalia chebula	Seed, Fruit	Reduces glucose level	[58]
Terminalia superba	Stem bark	Reduces glucose level	

II. CONCLUSION

The antidiabetic potential of biologically active analogues from plants sources will be accompanying with a mixture of phytoconstituents. Currently, naturally occurring inhibitors have been progressively attentive on medicinal purposes because of their non-toxic profile, fewer side effects, and easily available to the public. Moreover, the discovery of new natural antidiabetic drugs has shown great promise This mini survey helps the researchers and health professional who continuously engaged in findings and discovery of antidiabetic drugs. From the present work, it may be concluded that a good number of medicinal herbs have been confirmed as anti-diabetic candidate. Future researchers may undertake appropriate studies to obtain potent anti-diabetic compounds from these plants.

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DOI:10.15680/IJIRSET.2022.1105194

REFERENCES

- 1. Gharravi, A.M., Jafar, A., Ebrahimi, M., Mahmodi, A., Pourhashemi, E., Haseli, N., Talaie, N. and Hajiasgarli, P., 2018. Current status of stem cell therapy, scaffolds for the treatment of diabetes mellitus. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *12*(6), pp.1133-1139.
- 2. Khalil, H., 2017. Diabetes microvascular complications—A clinical update. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 11, pp.S133-S139.
- 3. You, W.P. and Henneberg, M., 2016. Type 1 diabetes prevalence increasing globally and regionally: the role of natural selection and life expectancy at birth. *BMJ open diabetes research and care*, 4(1), p.e000161.
- 4. Papatheodorou, K., Papanas, N., Banach, M., Papazoglou, D. and Edmonds, M., 2016. Complications of diabetes 2016. *Journal of diabetes research*, 2016.
- 5. Ashraf, H., Ahmad, J. and Akhtar, A., 2021. Advances in Prevention and Empirical Treatment of Diabetic Foot Infection. In *Diabetic Foot Ulcer* (pp. 201-213). Springer, Singapore.
- 6. Negi, P., Cheke, R.S. and Patil, V.M., 2021. Recent advances in pharmacological diversification of Src family kinase inhibitors. *Egyptian Journal of Medical Human Genetics*, 22(1), pp.1-16.
- Van Ommen, B., Wopereis, S., Van Empelen, P., Van Keulen, H.M., Otten, W., Kasteleyn, M., Molema, J.J., De Hoogh, I.M., Chavannes, N.H., Numans, M.E. and Evers, A.W., 2018. From diabetes care to diabetes cure—the integration of systems biology, eHealth, and behavioral change. *Frontiers in endocrinology*, 8, p.381.
- 8. Gupta, A., Jelinek, H.F. and Al-Aubaidy, H., 2017. Glucagon like peptide-1 and its receptor agonists: Their roles in management of Type 2 diabetes mellitus. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 11(3), pp.225-230.
- 9. Yadav, D., Tiwari, A., Mishra, M., Subramanian, S.S., Baghel, U.S., Mahajan, S., Bisen, P.S. and Prasad, G.B.K.S., 2014. Anti-hyperglycemic and anti-hyperlipidemic potential of a polyherbal preparation "diabegon" in metabolic syndrome subject with type 2 diabetes. *African Journal of Traditional, Complementary and Alternative Medicines*, *11*(2), pp.249-256.
- 10. Maritim, A.C., Sanders, A. and Watkins Iii, J.B., 2003. Diabetes, oxidative stress, and antioxidants: a review. *Journal of biochemical and molecular toxicology*, *17*(1), pp.24-38.
- Ram, H. and Singh, A.K., 2020. Improvements in insulin resistance and β-cells dysfunction by ddp-4 inhibition potential of Withania Somnifera (L.) dunal root extract in type 2 diabetic rat. *Biointerface Res. Appl. Chem*, 11, pp.8141-8155.
- 12. Yadav, D., Tiwari, A., Mishra, M., Subramanian, S.S., Baghel, U.S., Mahajan, S., Bisen, P.S. and Prasad, G.B.K.S., 2014. Anti-hyperglycemic and anti-hyperlipidemic potential of a polyherbal preparation "diabegon" in metabolic syndrome subject with type 2 diabetes. *African Journal of Traditional, Complementary and Alternative Medicines*, *11*(2), pp.249-256.
- 13. Firke, S., Cheke, R., Ugale, V., Khadse, S., Gagarani, M., Bari, S. and Surana, S., 2021. Rationale Design, Synthesis, and Pharmacological Evaluation of Isatin Analogues as Antiseizure Agents. *Letters in Drug Design & Discovery*, *18*(12), pp.1146-1164.
- Chiasson, J.L., Josse, R.G., Gomis, R.F., Hanefeld, M., Karasik, A. and Laakso, M., 2004. Acarbose for the prevention of Type 2 diabetes, hypertension and cardiovascular disease in subjects with impaired glucose tolerance: facts and interpretations concerning the critical analysis of the STOP-NIDDM Trial data. *Diabetologia*, 47(6), pp.969-975.
- 15. Cheke, R.S., Shinde, S.D., Ambhore, J.P., Chaudhari, S.R. and Bari, S.B., 2022. Quinazoline: An update on current status against convulsions. *Journal of Molecular Structure*, *1248*, p.131384.
- 16. Jung, M., Park, M., Lee, H.C., Kang, Y.H., Kang, E.S. and Kim, S.K., 2006. Antidiabetic agents from medicinal plants. *Current medicinal chemistry*, 13(10), pp.1203-1218.
- 17. Campbell-Tofte, J.I., Mølgaard, P. and Winther, K., 2012. Harnessing the potential clinical use of medicinal plants as anti-diabetic agents. *Botanics: targets and therapy*, 2, pp.7-19.
- 18. Cheke, R.S., Firke, S.D., Patil, R.R. and Bari, S.B., 2018. ISATIN: new hope against convulsion. *Central Nervous System Agents in Medicinal Chemistry (Formerly Current Medicinal Chemistry-Central Nervous System Agents)*, 18(2), pp.76-101.
- 19. Cheke, R.S., Narkhede, R.R., Shinde, S.D., Ambhore, J.P. and Jain, P.G., 2021. Natural product emerging as potential SARS spike glycoproteins-ACE2 inhibitors to combat COVID-19 attributed by in-silico investigations. *Biointerface Res. Appl. Chem*, *11*, pp.10628-10639.
- Salehi, B., Ata, A., V Anil Kumar, N., Sharopov, F., Ramírez-Alarcón, K., Ruiz-Ortega, A., Abdulmajid Ayatollahi, S., Valere Tsouh Fokou, P., Kobarfard, F., Amiruddin Zakaria, Z. and Iriti, M., 2019. Antidiabetic potential of medicinal plants and their active components. *Biomolecules*, 9(10), p.551.

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Volume 11, Issue 5, May 2022

| DOI:10.15680/IJIRSET.2022.1105194 |

- 21. Surya, S., Salam, A.D., Tomy, D.V., Carla, B., Kumar, R.A. and Sunil, C., 2014. Diabetes mellitus and medicinal plants-a review. *Asian Pacific Journal of Tropical Disease*, 4(5), pp.337-347.
- 22. Shinde, S.D., Jain, P.G., Cheke, R.S., Surana, S.J. and Gunjegaonkar, S.M., 2021. Abrogation of cisplatininduced nephrotoxicity in rats and HEK-293 cell lines by formononetin: in vivo and in vitro study. *Comparative Clinical Pathology*, 30(4), pp.617-625.
- 23. Chan, C.H., Ngoh, G.C. and Yusoff, R., 2012. A brief review on anti-diabetic plants: Global distribution, active ingredients, extraction techniques and acting mechanisms. *Pharmacognosy reviews*, 6(11), p.22.
- 24. Grover, J.K., Yadav, S. and Vats, V., 2002. Medicinal plants of India with anti-diabetic potential. *Journal of ethnopharmacology*, *81*(1), pp.81-100.
- 25. Moller, D.E., 2001. New drug targets for type 2 diabetes and the metabolic syndrome. *Nature*, 414(6865), pp.821-827.
- Cheke, R.S., Patil, V.M., Firke, S.D., Ambhore, J.P., Ansari, I.A., Patel, H.M., Shinde, S.D., Pasupuleti, V.R., Hassan, M.I., Adnan, M. and Kadri, A., 2022. Therapeutic Outcomes of Isatin and Its Derivatives against Multiple Diseases: Recent Developments in Drug Discovery. *Pharmaceuticals*, 15(3), p.272.
- 27. Carlson, T.J. and King, S.R., 1997. From plant to patient: an ethnomedical approach to the identification of new drugs for the treatment of NIDDM. *Diabetologia*, 40, pp.614-617.
- 28. Rahimi, R., Nikfar, S., Larijani, B. and Abdollahi, M., 2005. A review on the role of antioxidants in the management of diabetes and its complications. *Biomedicine & Pharmacotherapy*, 59(7), pp.365-373.
- 29. Hasani-Ranjbar, S., Larijani, B. and Abdollahi, M., 2009. A systematic review of the potential herbal sources of future drugs effective in oxidant-related diseases. *Inflammation & Allergy-Drug Targets (Formerly Current Drug Targets-Inflammation & Allergy)(Discontinued)*, 8(1), pp.2-10.
- 30. Qais, N., Jahan, S. and Shajib, M.S., 2018. A review on anti-diabetic plants. *Dhaka University Journal of Pharmaceutical Sciences*, 17(1), pp.139-152.
- 31. Mardanyan, S., Sharoyan, S., Antonyan, A. and Zakaryan, N., 2011. Dipeptidyl peptidase IV and adenosine deaminase inhibition by Armenian plants and antidiabetic drugs. *International Journal of Diabetes and Metabolism*, 19(2), pp.69-74.
- 32. Krishnaiah, D., Devi, T., Bono, A. and Sarbatly, R., 2009. Studies on phytochemical constituents of six Malaysian medicinal plants. *Journal of medicinal plants research*, *3*(2), pp.067-072.
- 33. Chakrabarti, R., Bhavtaran, S., Narendra, P., Varghese, N., Vanchhawng, L., Mohamed Sham Shihabudeen, H. and Thirumurgan, K., 2011. Dipeptidyl peptidase-IV inhibitory activity of Berberis aristata. *J Nat Prod*, *4*, pp.158-163.
- 34. Shinde, S.D., Cheke, R.S., Tathe, P.R., Jain, P.G. and Narkhede, R.R., 2021. The Berberis aristata Ameliorates oxazolone induced contact dermatitis: in-vivo and in silico evidences. *Advances in Traditional Medicine*, *21*(4), pp.685-692.
- 35. Ameh, G.I. and Eze, C.S., 2010. Phytochemical constituents of some Nigerian plants. *Bio-Research*, 8(1), pp.614-617.
- 36. Imamura, K., Tsuyama, Y. and Hirata, T., 2011. Identification and characterization of a novel fermented substance produced by edible Aspergillus oryzae AO-1 that inhibits DPP-IV activity. *Journal of bioscience and bioengineering*, 111(1), pp.37-40.
- 37. Bharti, S.K., Krishnan, S., Kumar, A., Rajak, K.K., Murari, K., Bharti, B.K. and Gupta, A.K., 2012. Antihyperglycemic activity with DPP-IV inhibition of alkaloids from seed extract of Castanospermum australe: Investigation by experimental validation and molecular docking. *Phytomedicine*, 20(1), pp.24-31.
- 38. Raja, C.P. and Venkataraman, K., 2016. Aloe vera phytochemicals inhibits dipeptidyl peptidase iv (dpp-iv), an anti-diabetic target. *Int. J. Pharm. Bio. Sci*, *7*, pp.120-128.
- 39. Parmar, H.S., Jain, P., Chauhan, D.S., Bhinchar, M.K., Munjal, V., Yusuf, M., Choube, K., Tawani, A., Tiwari, V., Manivannan, E. and Kumar, A., 2012. DPP-IV inhibitory potential of naringin: an in silico, in vitro and in vivo study. *Diabetes Research and Clinical Practice*, *97*(1), pp.105-111.
- Estrada-Salas, P.A., Montero-Morán, G.M., Martínez-Cuevas, P.P., González, C. and Barba de la Rosa, A.P., 2014. Characterization of antidiabetic and antihypertensive properties of canary seed (Phalaris canariensis L.) peptides. *Journal of Agricultural and Food Chemistry*, 62(2), pp.427-433.
- Velarde-Salcedo, A.J., Barrera-Pacheco, A., Lara-González, S., Montero-Morán, G.M., Díaz-Gois, A., De Mejia, E.G. and De La Rosa, A.P.B., 2013. In vitro inhibition of dipeptidyl peptidase IV by peptides derived from the hydrolysis of amaranth (Amaranthus hypochondriacus L.) proteins. *Food chemistry*, 136(2), pp.758-764.
- 42. Borde, M.K., Suman, R.K., Mohanty, I.R. and Deshmukh, Y.A., 2016. Dipeptidyl peptidase-IV inhibitory activities of medicinal plants: Terminalia arjuna, Commiphora mukul, Gymnema sylvestre, Morinda citrifolia, Emblica officinalis. *Asian Journal of Pharmaceutical and Clinical Research*, pp.180-182.

よう IJIRSET | e-ISSN: 2319-8753, p-ISSN: 2320-6710| <u>www.ijirset.com</u> | Impact Factor: 8.118|

Volume 11, Issue 5, May 2022

| DOI:10.15680/IJIRSET.2022.1105194 |

- 43. Narkhede, R.R., Pise, A.V., Cheke, R.S. and Shinde, S.D., 2020. Recognition of natural products as potential inhibitors of COVID-19 main protease (Mpro): In-silico evidences. *Natural products and Bioprospecting*, *10*(5), pp.297-306.
- 44. Patil, V.M., Narkhede, R.R., Masand, N., Rameshwar, S., Cheke, R.S. and Balasubramanian, K., 2020. Molecular insights into resveratrol and its analogs as SARS-CoV-2 (COVID-19) protease inhibitors. Coronaviruses.
- 45. Ekayanti, M., Sauriasari, R. and Elya, B., 2018. Dipeptidyl peptidase IV inhibitory activity of fraction from white tea ethanolic extract (Camellia sinensis (L.) Kuntze) ex vivo. *Pharmacognosy Journal*, *10*(1).
- 46. Saidu, Y., Muhammad, S.A., Abbas, A.Y., Onu, A., Tsado, I.M. and Muhammad, L., 2017. In vitro screening for protein tyrosine phosphatase 1B and dipeptidyl peptidase IV inhibitors from selected Nigerian medicinal plants. *Journal of intercultural ethnopharmacology*, 6(2), p.154.
- 47. Huang, C.N., Wang, C.J., Lee, Y.J. and Peng, C.H., 2017. Active subfractions of Abelmoschus esculentus substantially prevent free fatty acid-induced β cell apoptosis via inhibiting dipeptidyl peptidase-4. *PloS* one, 12(7), p.e0180285.
- 48. Setyaningsih, E.P., Saputri, F.C. and Mun'im, A., 2019. The antidiabetic effectivity of Indonesian plants extracts via DPP-IV inhibitory mecha
- 49. Riyanti, S., Suganda, A.G. and Sukandar, E.Y., 2016. Dipeptidyl peptidase-IV inhibitory activity of some Indonesian medicinal plants. *Asian Journal of Pharmaceutical and Clinical Research*, pp.375-377.nism. *Journal of Young Pharmacists*, 11(2), p.161.
- 50. Narkhede, R.R., Cheke, R.S., Ambhore, J.P. and Shinde, S.D., 2020. The molecular docking study of potential drug candidates showing anti-COVID-19 activity by exploring of therapeutic targets of SARS-CoV-2. *Eurasian Journal of Medicine and Oncology*, 4(3), pp.185-195.
- 51. Singh, A.K., Joshi, J. and Jatwa, R., 2013. Dipeptidyl peptidase IV (DPP-IV/CD26) inhibitory and free radical scavenging potential of W. somnifera and T. foenum-graecum extract. *International Journal of Phytomedicine*, *5*(4), p.503.
- 52. SINGH, A.K., Jatwa, R. and Joshi, J.A.Y.A., 2014. Cytoprotective and dipeptidyl peptidase IV (DPP-IV/CD26) inhibitory roles of Ocimum sanctum and Momordica charantia extract. *health*, 20, p.22.
- Saidu, Y., Muhammad, S.A., Abbas, A.Y., Onu, A., Tsado, I.M. and Muhammad, L., 2017. In vitro screening for protein tyrosine phosphatase 1B and dipeptidyl peptidase IV inhibitors from selected Nigerian medicinal plants. *Journal of intercultural ethnopharmacology*, 6(2), p.154.
- 54. Ram, H., Jaipal, N., Kumar, P., Deka, P., Kumar, S., Kashyap, P., Kumar, S., Singh, B.P., Alqarawi, A.A., Hashem, A. and Tabassum, B., 2019. Dual inhibition of DPP-4 and cholinesterase enzymes by the phytoconstituents of the ethanolic extract of Prosopis cineraria pods: therapeutic implications for the treatment of diabetes-associated neurological impairments. *Current Alzheimer Research*, *16*(13), pp.1230-1244.
- 55. Kalhotra, P., Chittepu, V.C., Osorio-Revilla, G. and Gallardo-Velazquez, T., 2020. Phytochemicals in garlic extract inhibit therapeutic enzyme DPP-4 and induce skeletal muscle cell proliferation: A possible mechanism of action to benefit the treatment of diabetes mellitus. *Biomolecules*, *10*(2), p.305.
- 56. Bnouham, M., Ziyyat, A., Mekhfi, H., Tahri, A. and Legssyer, A., 2006. Medicinal plants with potential antidiabetic activity-A review of ten years of herbal medicine research (1990-2000). *International Journal of Diabetes and Metabolism*, 14(1), p.1.
- 57. Eddouks, M., Lemhadri, A., Zeggwagh, N.A. and Michel, J.B., 2005. Potent hypoglycaemic activity of the aqueous extract of Chamaemelum nobile in normal and streptozotocin-induced diabetic rats. *Diabetes research and clinical practice*, 67(3), pp.189-195.
- 58. Lo, H.C., Tsai, F.A., Wasser, S.P., Yang, J.G. and Huang, B.M., 2006. Effects of ingested fruiting bodies, submerged culture biomass, and acidic polysaccharide glucuronoxylomannan of Tremella mesenterica Retz.: Fr. on glycemic responses in normal and diabetic rats. *Life Sciences*, 78(17), pp.1957-1966.





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