Urban Ethnobotany of Jammu: Traditional use of Medicinal plants in diabetes management

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ABSTRACT

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| This study investigates the ethnomedicinal use of plants for diabetes management in urban areas of Jammu, highlighting the significance of traditional knowledge in contemporary era. Several field surveys were conducted in Jammu district, from 2022 to 2024, focusing on medicinal plant usage among local communities. Ethnobotanical data was collected through interviews with elderly community members, traditional healers, and herbal practitioners using semi-structured questionnaires. Plant species were collected, identified, documented, and categorized based on their reported anti-diabetic properties. The study identified 20 plant species from 19 genera and 14 families, introducing novel anti-diabetic ethnomedicinal uses for eight species, including *Alstonia scholaris, Butea monosperma, Eucalyptus globulus, Hibiscus × rosa-sinensis, Ipomoea carnea, Kalanchoe pinnata, Monoon longifolium*, and *Oxalis corniculata*, enriching the ethnomedicinal knowledge of Jammu & Kashmir. The findings underscore the urgent need for conservation efforts to safeguard both medicinal plant biodiversity and indigenous knowledge of these species. Promoting sustainable practices and integrating traditional plant-based remedies along with modern healthcare diabetes management while preserving cultural heritage. |

*Keywords: Urban Ethnobotany, diabetes, Jammu, Jammu & Kashmir, medicinal plants, novel uses*

1. INTRODUCTION

Diabetes is a complex metabolic disorder diagnosed by persistently elevated blood sugar levels, resulting from metabolic dysregulation of carbohydrates, resulting in impaired insulin function, defective insulin secretion, or both (Suji and Sivakami, 2003; Mirhoseini et al., 2013). Diabetes affects approximately 100 million people each year and is ranked as the seventh leading cause of death globally. A recent statistical update from the International Diabetes Federation (IDF) indicate that an estimated 537 million adults, aged 20 to 79 are currently living with diabetes. This number is expected to increase to 643 million by 2030 and probably 783 million by 2045 (https://www.diabetesatlas.org). The Indian subcontinent has emerged as a major hotspot for this growing health crisis. Among adults aged 20 to 79, the estimated prevalence rates of the disease are 8.31% in India compared to the 7.77% in Sri Lanka, 6.72% in Pakistan, and just 3.03% in Nepal (Rizvi and Mishra, 2013). Nagarathna et al., 2020 recorded that the number of individuals with diabetes in India is expected to reach 79.4 million by the year 2030.

Diabetes manifests in different forms, Type I, Type II, and gestational diabetes are the most prevalent ones. Type I diabetes arises when beta cells fail to produce adequate insulin, and it is more commonly diagnosed in children. In contrast, Type II diabetes occurs when insulin receptors become resistant to the insulin produced by the body (Neamsuvan et al., 2015). Type II form is the most widespread and is often linked to an unhealthy lifestyle, including poor diet, physical inactivity, stress, and obesity, on the other hand, gestational diabetes develops during pregnancy. Clinically, Diabetes mellitus is recognized as a silent disease, contributing as one of the major risk factors for health (Lima et al., 2016). Uncontrolled management makes the patients susceptible to developing complications like nephropathy, retinopathy, neuropathy, and cardiovascular diseases which add to the morbidity of the disease leading to premature deaths (Lima et al., 2016; Mirhoseini et al., 2016; Khalil, 2017; Padhi et al., 2020).

**Modern allopathic medicine**

Managing diabetes mellitus remains a global challenge causing many countries to declare it as a pandemic of the 21st century. The primary and most effective treatments for diabetes mellitus are Insulin injections and hypoglycemic agents which are commonly used to regulate the blood sugar levels in the patients. However, these medications are associated with various limitations like limited tolerability, high cost, and other potential side effects making them less effective in preventing long-term complications of the disease (Swanston-Flatt et al., 1989; Parasuraman et al., 2014). Given the growing understanding of diabetes and its associated risks, there is a need to identify alternative treatments with fewer adverse effects. Medicinal plants serve as valuable sources for potential complementary or alternative therapies for diabetes and other health conditions (Eddouks et al., 2014; Jamila and Mostafa, 2014).

**Herbal remedy**

The use of medicinal plants has contributed to a decline in the occurrence of various diseases due to their protective effects against oxidative damage and their ability to reduce inflammation. WHO accounts that nearly 90% of diabetes patients in developing countries depend on plant-based remedies for managing the disease. Globally, around 21,000 medicinal plant species have been identified, with approximately 2,500 of them found in India (Rani et al., 2020). Among these, about 800 plant species have been recognized for their antidiabetic properties (Patil et al., 2011). Recent studies have focused on exploring traditional uses, evaluating the in vitro effects of medicinal plants, and identifying their bioactive compounds to develop herbal medicines (Moradi et al., 2015; Asadi-Samani et al., 2017). Several researchers have worked on the plants which are traditionally used by various indigenous communities against diabetes in different parts of India (Ryakala et al., 2010; Thirumalai et al., 2012; Mishra et al., 2019; Das et al., 2023) and Jammu & Kashmir (Bhatia et al., 2014; Gairola et al., 2014; Shah et al., 2015; Ajaz and Ahmed, 2017; Khan and Paul, 2017), but there is no report of plants being used by the indigenous populace district Jammu against diabetes. Keeping this in view, the present study was conducted to identify the plants growing in the urban areas and used by the people, who have access to the allopathic medicine, as an alternative medicine for the prevention and treatment of diabetes.

2. material and methods

**2.1 Study Area**

Jammu District, one of the districts of Jammu province, is the winter capital of Jammu and Kashmir (J&K), the northernmost Union Territory of India. The district shares its borders with Pakistan and Ladakh. Jammu district and is located along the banks of the Tawi River. It lies between 32°44'46" N and 75°50'51" E, with an average elevation of 327 meters above sea level, and is divided into 21 tehsils. The district experiences a subtropical and humid climate, with summer temperatures reaching up to 48°C and winter temperatures dropping below freezing.

**2.2 Survey and data collection**

Systematic and extensive field surveys were conducted from June 2022 to July 2024 across various locations in Jammu district, including Nagrota, Gandhi Nagar, Canal Road, R.S. Pura, Shakti Nagar, Akhnoor and Khour. The exploration covered diverse plant habitats such as roadsides, riverbanks, forests, meadows, valleys, and grasslands to document the ethnomedicinal flora of the region. Informants were selected randomly from the study area for the documentation of traditional knowledge. Informants were chosen from different age groups and occupation like students, businessmen, shopkeepers, milkmen, teachers, elder people etc. and were interviewed using semi-structured questionnaire. Plants mentioned by the informants which are traditionally used against several disease were collected, dried, mounted on herbarium sheets and identified by consulting the regional herbaria like herbaria of the Department of Botany, University of Jammu (HBJU), and Janaki Ammal Herbarium, Indian Institute of Integrative Medicine (RRLH), Jammu, and with the help of various regional floras (Kachroo et al., 1977; Sharma and Kachroo 1981; Dhar and Kachroo, 1983; Singh and Kachroo, 1994; Swami and Gupta, 1998).The latest accepted names and nomenclatural classification of the taxa were checked using Plants of the World Online (POWO, 2025) and World Flora Online (WFO, 2025)

3. results and discussion

**3.1 Diversity of the plant species**

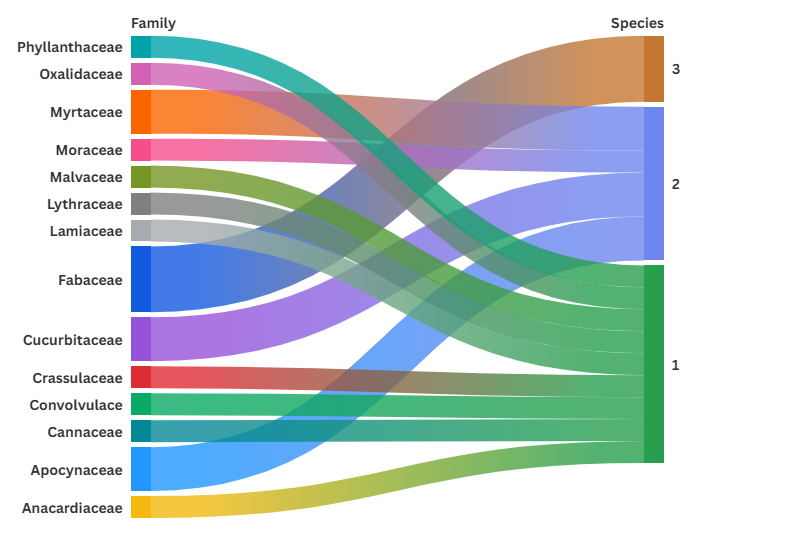
The present study identified twenty plant species from 19 genera and 14 families, which are traditionally used by the urban population of Jammu district for diabetes management (Table 1). Among the plant families, Fabaceae exhibited the highest representation with three species, followed by Apocynaceae, Cucurbitaceae, Moraceae, and Myrtaceae, each contributing two species. The remaining families were represented by a single species each (Fig. 1). Comparatively, Das et al. (2023) reported Apocynaceae and Fabaceae as the dominant families for diabetes treatment among the Bhuyan Tribes in Sundargarh District, Odisha. Interestingly, our findings align with those of Singh et al. (2020), who also documented Fabaceae as the most prevalent family associated with diabetes and cancer treatment in Mizoram, comprising 14 species.

In this study, trees were found to be the most commonly utilized plant habit for diabetes treatment, accounting for 50% of the recorded species. This was followed by herbs (25%), shrubs (15%), and climbers (10%) (Fig. 2). Similar findings have been reported in previous studies (Mishra et al., 2019; Singh et al., 2020; Das et al., 2023), where trees were identified as the primary source of antidiabetic plants. The preference for trees may be attributed to the diverse usable parts, availability, abundance of bioactive compounds and deep-rooted significance in traditional medicine.

Of the various plant parts used, leaves, flowers, fruits, and stem bark were the most frequently used (18.75%), followed by roots (9.38%), while whole plants and stems contributed 6.25% each, and seeds were the least used (3.13%) (Fig. 3). Previous research (Begum et al., 2018; Mishra et al., 2019; Singh et al., 2020; Das et al., 2023) has also highlighted leaves as the most commonly utilized plant part for diabetes treatment. However, Naini and Mamidala (2013) reported roots as the dominant plant part used in diabetes management.

**Table 1. Plants used by the local people of district Jammu to treat diabetes**

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| Botanical name | Family | Local Dogri names | Habit | Flowering and Fruiting | Part used as medicine |
| *Alstonia scholaris* (L.) R.Br. | Apocynaceae | Satpatra | Tree | March to July | Stem bark |
| *Bauhinia purpurea* L. | Fabaceae | Kalyad | Tree | September to November | Flowers |
| *Butea monosperma* (Lam.) Kuntze | Fabaceae | Plah | Tree | February to June | Flowers |
| *Canna indica* L. | Cannaceae | Keli | Herb | June to October | Seeds |
| *Catharanthus roseus* (L.) G.Don | Apocynaceae | Sadabahar | Shrub | April to September | Flowers |
| *Coccinia grandis* (L.) Voigt | Cucurbitaceae | Kantoori | Climber | August to September | Fruits |
| *Eucalyptus globulus* Labill*.* | Myrtaceae | Safeda | Tree | September to March | Leaves |
| *Hibiscus* × *rosa-sinensis* L. | Malvaceae | Gulhar | Shrub | March to October | Flowers, Leaves and Roots |
| *Ipomoea carnea* G.Frost | Convolvulace | Akk | Herb | March to November | Stem |
| *Kalanchoe pinnata* (Lam.) Pers. | Crassulaceae | Goethe | Herb | November to March | Whole plant, Leaves |
| *Lawsonia inermis* L. | Lythraceae | Maendi | Shrub | April to September | Stem bark, Roots, Flowers |
| *Mangifera indica* L. | Anacardiaceae | Amb | Tree | March to July | Roots, Stem bark, Leaves, Fruits |
| *Momordica charantia* L. | Cucurbitaceae | Karela | Climber | June to October | Fruit |
| *Monoon longifolium*(Sonn.) B.Xue & R.M.K.Saunders | Fabaceae | Sita shok | Tree | March to July | Stem bark |
| *Morus alba* L. | Moraceae | Toot | Tree | April to June | Stem bark |
| *Morus nigra* L. | Moraceae | Shehtoot | Tree | April to August | Fruits |
| *Ocimum tenuiflorum* L. | Lamiaceae | Tulsi | Herb | June to October | Stem, Leaves, Flowers |
| *Oxalis corniculata* L. | Oxalidaceae | Changeri ghaa | Herb |  | Whole plant |
| *Phyllanthus emblica* L. | Phyllanthaceae | Ambla | Tree | March to July | Fruits |
| *Psidium guajava* L. | Myrtaceae | Marood | Tree | April to September | Stem bark, Leaves, Immature fruits |

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**Fig. 1. Alluvial diagram showing the number of species in the respective families**

**Fig. 2. Percent contribution of different ethno-medicinal plant habit**

**Fig. 3. Percentage of plant parts used in ethnoveterinary remedies.**

**3.2 Usage of Medicinal plants**

In the present study, the stem bark of *Alstonia scholaris* has been recorded for its use in diabetes treatment, While previous studies have documented its medicinal applications for conditions such as dyspepsia, liver disorders, diarrhea, and skin diseases (Akhtar & Bano, 2002; Banik et al., 2010). However, its specific use against diabetes in Jammu and Kashmir has not been previously reported, making this a novel ethnomedicinal claim for the region.

Similarly, the flowers of *Bauhinia purpurea* have been widely recognized for their antidiabetic properties in various global studies (Malaysia, 2023; Gudavalli et al., 2024), but no prior documentation exists regarding their use for diabetes treatment in Jammu and Kashmir. In urban areas of Jammu, the flowers of *Butea monosperma* are utilized for diabetes management, a well-established medicinal application (Somani et al., 2006; Ahmed et al., 2012; Talubmook & Buddhakala, 2012). However, while *B. monosperma* flowers have previously been reported in Jammu and Kashmir for treating urinary retention and irregular menstruation (Shah et al., 2015; Rao et al., 2015), but their role in diabetes treatment has not been documented before. This finding represents a novel addition to the ethnobotanical knowledge of the region.

Similarly, the seeds of *Canna indica* have been documented for their antidiabetic properties in the study area. However, previous research by Kanase and Vishwakarma (2018) highlighted the potential of its roots in diabetes management. Similarly, the fruits of *Coccinia grandis* are commonly used in the study area for diabetes treatment, a practice that has also been documented in other regions (Hossain et al., 2024). Additionally, this usage was previously reported from the Kathua district of Jammu & Kashmir (Parasher et al., 2024).

Several plants, including *Eucalyptus globulus, Hibiscus × rosa-sinensis, Ipomoea carnea, Kalanchoe pinnata, Monoon longifolium,* and *Oxalis corniculata*, have been extensively studied for their antidiabetic properties (Rahmatullah et al., 2009; Raj et al., 2014; Revathi et al., 2017; Begum et al., 2018; Singh et al., 2020; Abdelaali et al., 2023; Bisht et al., 2024). However, no prior records exist of these species being used for diabetes management by the people of Jammu & Kashmir. This study, therefore, presents new ethnomedicinal insights specific to the region.

**3.3 Novelty of the study**

There are no previous studies found focusing on anti-diabetic uses of medicinal plants making this the first report of the documentation of anti-diabetic plants used by people in the urban areas of Jammu. Also, the present study provides anti-diabetic ethnomedicinal uses of eight plants viz., *Alstonia scholaris, Butea monosperma, Eucalyptus globulus, Hibiscus × rosa-sinensis, Ipomoea carnea, Kalanchoe pinnata, Monoon longifolium, Oxalis corniculata*, as novel additions to the ethnomedicinal data of Jammu & Kashmir.

4. Conclusion

The present study highlights the rich ethnomedicinal knowledge of urban communities in Jammu district regarding the use of plant species for diabetes management. The findings of this study underscore the importance of preserving and further exploring traditional plant-based remedies in the management of diabetes and other diseases as well. Given the growing threat of habitat destruction and urbanization, urgent conservation efforts and scientific validation of these medicinal plants are essential for integrating traditional knowledge into modern healthcare practices.

References

1. Suji, G., & Sivakami, S. (2003). Approaches to the treatement of diabetes mellitus: an overview. *Cellular and molecular biology (Noisy-le-Grand, France)*, *49*(4), 635-639.
2. Mirhoseini, M., Baradaran, A., & Rafieian-Kopaei, M. (2013). Medicinal plants, diabetes mellitus and urgent needs. *J HerbMed Pharmacol*, *2*(2), 53-54.
3. Worldwide toll of diabetes. Diabetesatlas.org. 2020. https://www.diabetesatlas.org/en/sections/worldwide-toll-of-diabetes.html. Accessed 6 Jan 2025.
4. Rizvi, S. I., & Mishra, N. (2013). Traditional Indian medicines used for the management of diabetes mellitus. *Journal of diabetes research*, *2013*(1), 712092.
5. Nagarathna, R., Tyagi, R., Battu, P., Singh, A., Anand, A., & Nagendra, H. R. (2020). Assessment of risk of diabetes by using Indian Diabetic risk score (IDRS) in Indian population. *Diabetes research and clinical practice*, *162*, 108088.
6. Neamsuvan, O., Madeebing, N., Mah, L., & Lateh, W. (2015). A survey of medicinal plants for diabetes treating from Chana and Nathawee district, Songkhla province, Thailand. *Journal of ethnopharmacology*, *174*, 82-90..
7. Lima, V. C., Cavalieri, G. C., Lima, M. C., Nazario, N. O., & Lima, G. C. (2016). Risk factors for diabetic retinopathy: a case–control study. *International journal of retina and vitreous*, *2*, 1-7.
8. Khalil, H. (2017). Diabetes microvascular complications—A clinical update. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *11*, S133-S139..
9. Padhi, S., Nayak, A. K., & Behera, A. (2020). Type II diabetes mellitus: a review on recent drug based therapeutics. *Biomedicine & Pharmacotherapy*, *131*, 110708.
10. Swanston-Flatt, S. K., Day, C., Bailey, C. J., & Flatt, P. R. (1989). Evaluation of traditional plant treatments for diabetes: studies in streptozotocin diabetic mice. *Acta diabetologia latina*, *26*, 51-55..
11. Parasuraman, S., Thing, G. S., & Dhanaraj, S. A. (2014). Polyherbal formulation: Concept of ayurveda. *Pharmacognosy reviews*, *8*(16), 73.
12. Eddouks, M., Chattopadhyay, D., De Feo, V., & Cho, W. C. S. (2014). Medicinal plants in the prevention and treatment of chronic diseases 2013. *Evidence-based Complementary and Alternative Medicine: eCAM*, *2014*, 180981.
13. Jamila, F., & Mostafa, E. (2014). Ethnobotanical survey of medicinal plants used by people in Oriental Morocco to manage various ailments. *Journal of ethnopharmacology*, *154*(1), 76-87.
14. Rani, V., Gupta, A., Megha, Awasthi, S., Suneja, T., Yadav, M., & Verma, S. (2020). Antidiabetic Activity of Indian Medicinal Plants. *Herbal Medicine in India: Indigenous Knowledge, Practice, Innovation and its Value*, 155-174.
15. Patil, R., Patil, R., Ahirwar, B., & Ahirwar, D. (2011). Current status of Indian medicinal plants with antidiabetic potential: a review. *Asian Pacific Journal of Tropical Biomedicine*, *1*(2), S291-S298..
16. Moradi, M. T., Karimi, A., Alidadi, S., & Gholami-Arjenaki, M. (2015). In vitro anti-herpes simplex type-1 activity, antioxidant potential and total phenolic compounds of pomegranate (Punica granatum L.) peel extract.
17. Asadi-Samani, M., Moradi, M. T., Mahmoodnia, L., Alaei, S., Asadi-Samani, F., & Luther, T. (2017). Traditional uses of medicinal plants to prevent and treat diabetes; an updated review of ethnobotanical studies in Iran. *Journal of nephropathology*, *6*(3), 118.
18. Ryakala, V. K., Ali, S. S., Sharanabasava, H., Hasin, N., Sharma, P., & Bora, U. (2010). Ethnobotany of plants used to cure diabetes by the people of north east India. *Medicinal and aromatic plant science and biotechnology*, *4*(1), 64-68.
19. Thirumalai, T., Beverly, C. D., Sathiyaraj, K., Senthilkumar, B., & David, E. (2012). Ethnobotanical Study of Anti-diabetic medicinal plants used by the local people in Javadhu hills Tamilnadu, India. *Asian Pacific Journal of Tropical Biomedicine*, *2*(2), S910-S913.
20. Mishra, J. I. B. A. N., Mahalik, G. Y. A. N. R. A. N. J. A. N., & Parida, S. A. G. A. R. I. K. A. (2019). Ethnobotanical study of traditional medicinal plants used in the management of diabetes in the urban areas of Khurda, Odisha, India. *Asian J Pharm Clin Res*, *12*(9), 73-78.
21. Das, J., Acharya, B. C., & Mallick, S. N. (2023). Traditional ethno-medicinal plants used for treatment of diabetes by Bhuyan tribes in Sundargarh District of Odisha, India-an ethnobotanical survey. *Plant Sci. Today*, *10*, 58-67.
22. Singh, R., Navneet, D. K., & Kumar, A. (2020). Ethnobotanical and pharmacological aspects of *Ipomoea carnea* Jacq. and *Celosia cristata* Linn. *Current Status of Researches in Biosciences. Today & Tomorrow’s Printers and Publishers*, 493-506.
23. Bhatia, H., Sharma, Y. P., Manhas, R. K., & Kumar, K. (2014). Ethnomedicinal plants used by the villagers of district Udhampur, J&K, India. *Journal of ethnopharmacology*, *151*(2), 1005-1018.
24. Gairola, S., Sharma, J., & Bedi, Y. S. (2014). A cross-cultural analysis of Jammu, Kashmir and Ladakh (India) medicinal plant use. *Journal of Ethnopharmacology*, *155*(2), 925-986.
25. Shah, A., Bharati, K. A., Ahmad, J., & Sharma, M. P. (2015). New ethnomedicinal claims from Gujjar and Bakerwals tribes of Rajouri and Poonch districts of Jammu and Kashmir, India. *Journal of ethnopharmacology*, *166*, 119-128.
26. Ajaz, T., & Ahmed, S. (2017). Ethnomedicinal plants recorded from Poonch district of J&K State (India). *Journal of Pharmacognosy and Phytochemistry*, *6*(1), 405-410.
27. Khan, J.A., & Paul., R. (2017). Folk medicinal plants used on diabetes and blood purification in Poonch district of Jammu and Kashmir North West Himalaya India. *Asian Journal of Agriculture & Life Sciences*. 2: 1-5.
28. Kachroo, P., Sapru, B.L., & Dhar, U. (1977). Flora of Ladakh: an ecological and taxonomical appraisal. *Bishen Singh Mahendra Pal Singh,* Cannaught Place, Dehradun. Pp. 73
29. Sharma, B. M., & Kachroo, P. (1981). Flora of Jammu and plants of neighbourhood. *Bishen Singh Mahendra Pal Singh, Cannaught* Place, Dehradun. Pp.135
30. Dhar, U., & Kachroo, P. (1983). Alpine Flora of Kashmir Himalaya. *Scientific Publishers,* Jodhpur. Pp. 93
31. Swami, A. & Gupta B.K. (1998). Flora of Udhampur. Bishen Singh Mahendra Pal Singh, Cannaught Place, Dehradun.
32. POWO. 2025. "Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; https://powo.science.kew.org/ Retrieved 04 January 2025."
33. WFO. 2025. World Flora Online. Published on the Internet;  
    [http://www.worldfloraonline.org](http://www.worldfloraonline.org/). Accessed on: 04 January 2025
34. Singh, J.B., & Kachroo, P. (19940. Forest flora of Pir Panjal Range (Northweastern Himalaya). *Bishen Singh Mahendra Pal Singh.*
35. Singh, G., Passari, A. K., Momin, M. D., Ravi, S., Singh, B. P., & Kumar, N. S. (2020). Ethnobotanical survey of medicinal plants used in the management of cancer and diabetes. *Journal of Traditional Chinese Medicine*, *40*(6).
36. Begum, S., Hussain, S., Mehmood, A., Ahmad, K. S., & Hamid, A. (2018). Harnessing the potential of medicinal plants used for the treatment of diabetes in rural areas of Azad Jammu and Kashmir, Pakistan. *Applied Ecology & Environmental Research*, *16*(5).
37. Naini, V., & Mamidala, E. (2013). An ethnobotanical study of plants used for the treatment of diabetes in the Warangal district, Andhra Pradesh, India. *Biolife*, *1*(1), 24-28.
38. AKHTAR, M. S., & BANO, H. (2002). Hypoglycaemic Effect of Powdered *Alstonia Scholaris* (Satona). *The Professional Medical Journal*, *9*(03), 268-271..
39. Banik, G., Bawari, M., Choudhury, M. D., Choudhury, S., & Sharma, G. D. (2010). Some anti-diabetic plants of Southern Assam. *Assam University Journal of Science and Technology*, *5*(1), 114-119.
40. Malaysia Sabah, K. K. (2023). A Review of Antidiabetic Activity of *Bauhinia purpurea* plant and its Phytochemical Constituents. *Asian Journal of Medicine and Health Sciences Vol*, *6*(2), 52.
41. Gudavalli, D., Pandey, K., Ede, V. G., Sable, D., Ghagare, A. S., & Kate, A. S. (2024). Phytochemistry and pharmacological activities of five species of Bauhinia genus: A review. *Fitoterapia*, *174*, 105830.
42. Somani, R., Kasture, S., & Singhai, A. K. (2006). Antidiabetic potential of *Butea monosperma* in rats. *Fitoterapia*, *77*(2), 86-90.
43. Ahmed, F., Siddaraju, N. S., Harish, M., & Urooj, A. (2012). Effect of *Butea monosperma* Lam. leaves and bark extracts on blood glucose in streptozotocin-induced severely diabetic rats. *Pharmacognosy research*, *4*(1), 33.
44. Talubmook, C., & Buddhakala, N. (2012). Antioxidant and antidiabetic activities of flower extract from *Butea monosperma* (Lam.) Taub. *GSTF International Journal on Bioformatics & Biotechnology (JBio)*, *2*(1), 7.
45. Rao, P. K., Hasan, S. S., Bhellum, B. L., & Manhas, R. K. (2015). Ethnomedicinal plants of Kathua district, J&K, India. *Journal of ethnopharmacology*, *171*, 12-27..
46. Kanase, V. A. N. I. T. A., & Vishwakarma, S. U. N. I. T. A. (2018). Treatment of various diseases by *Canna indica* L.-a promising herb. *Asian J Pharm Clin Res*, *11*(12), 51-56.
47. Hossain, M. S., Jahan, I., Islam, M., Nayeem, J., Anzum, T. S., Afrin, N. A., ... & Hasan, M. K. (2024). *Coccinia grandis:* Phytochemistry, pharmacology and health benefits. *Clinical Traditional Medicine and Pharmacology*, *5*(2), 200150.
48. Parasher, M., Pandey, D. K., & Manhas, R. K. (2024). Traditionally used anti-diabetic plants in Kathua district of Union Territory of Jammu and Kashmir, India. *Journal of Ethnopharmacology*, *319*, 117087.
49. Rahmatullah, M., Ferdausi, D., Mollik, M. A. H., Azam, M. N. K., Rahman, M. T., & Jahan, R. (2009). Ethnomedicinal survey of Bheramara area in Kushtia district, Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, *3*(3), 534-541.
50. Raj, A., Gururaja, M. P., Joshi, H., & Shastry, C. S. (2014). *Kalanchoe pinnatum* in treatment of gallstones: An ethnopharmacological review. *International Journal of PharmTech Research*, *6*(1), 252-261.
51. Revathi, G., Elavarasi, S., Saravanan, K., & Bahadur, B. (2017). Traditional use of herbal plants for the treatment of diabetes in India. *Ethnobotany of India, NorthEast India, Andaman and Nicobar Islands*, *3*.
52. Abdelaali, B., Taha, D., Hannou, Z., Hamri, E., Ayoub, N. E. M., Bouyahya, A., & Mubarak, M. S. (2023). Bioactive Compounds 31 and Antidiabetic and Other Health Benefts of Eucalyptus globulus. *Antidiabetic Medicinal Plants and Herbal Treatments*, 469.
53. Bisht, D., Prakash, D., Kumar, R., Shakya, A. K., & Shrivastava, S. (2024). Phytochemical profiling and nephroprotective potential of ethanolic leaf extract of *Polyalthia longifolia* against cisplatin-induced oxidative stress in rat model. *Journal of Ethnopharmacology*, *326*, 117922.