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Medicinal Plants And Herbs For Diabetes A Review

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Abstract: The presence of phytochemicals that have therapeutic importance gives medicinal plants a great deal of potential in treating a wide range of diseases. There are various commercially available drugs to treat the symptoms of diabetes, a dangerous metabolic illness. On the other hand, these OTC medications come with several drawbacks and are costly. Due to their lower costs and better therapeutic results with fewer side effects, herbal medications are becoming more and more popular. The reports that are currently available on medicinal plants used to treat issues related to diabetes are included in this review. The knowledge in this review of the many medicinal plants can be used to address diabetes-related issues. Several search engines, including Google Scholar, PubMed, Science Direct, and other online journals and books, were used to conduct a thorough search on medicinal plants with anti-diabetic qualities. The active ingredients and processes of these plants can be studied further through research.

Keywords: Medicinal plant, Diabetes, Phytochemical, Herbal medicines, Antidiabetics

Introduction: The field of herbal medicine has grown exponentially in the past several years, and due to their natural origins and low side effects, these medications are becoming more and more popular in both developed and developing nations. Organic materials, minerals, and medicinal plants are the sources of many conventional medications (Grover *et al*., 2002). Herbal preparations used in Indian traditional health care systems contain several medicinal plants known as Rasayana, which have been utilized for over a millennium (Scartezzini *et al*., 2000). The majority of doctors in Indian medical systems create and administer their recipes (Seth *et al*., 2004). The World Health Organisation (WHO) has compiled a list of 21,000 plants that are utilized globally for therapeutic purposes. India is home to 2500 species, of which 150 are exploited on a very considerable scale in commercial contexts. As the world's largest producer of medicinal herbs, India is referred to as the botanical garden of the globe (Seth *et al*., 2004). With over 61 million people suffering from diabetes, India is referred to as the "capital of diabetes". According to Viswanathan and Rao (2013), India continues to face significant challenges in effectively treating diabetes and its accompanying complications. These challenges include inadequate healthcare systems and inadequate infrastructure. Since herbal formulations have fewer side effects and are more affordable than synthetic medications, they are preferred for reducing the negative effects of diabetes and its related issues (Modak *et al*. 2007). Based on online electronic literature data, the current review attempts to provide an overview of some of the significant Indian medicinal herbs that have anti-diabetic properties. Hyperglycemia, a shift in the metabolism of fats, carbs, and proteins, and other symptoms define diabetes mellitus (Ishihara *et al*., 2005). Absolute or relative insulin shortage causes glucose levels to rise, which is the hallmark of the most prevalent chronic metabolic disease: diabetes mellitus. Yu Zengyang *et al*. (2015)

state that medicine, exercise, and food are all part of the treatment. Since insulin and hypoglycemic medications are currently the primary and most successful forms of diabetes treatment, there are several negative side effects associated with these medications (Das *et al*., 2009). Increasing the usage of medicinal plants is due to several factors. Studies have looked into the potential antidiabetic properties of numerous plants from throughout the globe. In addition to discussing the medicinal plants that are recommended in Iranian traditional medicine for the treatment of diabetes, this review study listed some of the most significant plants with hypoglycemic qualities based on credible clinical and laboratory data. Historically, medicinal plants have been a valuable resource for discovering novel treatments for illnesses affecting human health. Numerous herbs have historically been suggested as treatments for diabetes. Additionally, a large number of researchers have documented the anti-diabetic properties of numerous plants.

Antidiabetic Indian herbs: Numerous herbal therapies have been proposed for the treatment of diabetes and its related problems. The primary components of these compositions are medicinal herbs. In China and India, traditional herbal remedies have long been used to manage diabetes. Many literatures, like Susruta Samhita and Charaka Samhita, describe the phytopharmacological aspects of diabetes and its harmful effects (Prabhakar *et al*., 2011). Herbal preparations are widely accessible without a prescription. These herbal remedies are prescribed for illnesses that pose a serious risk to life. When chemical medications are not successful in treating a patient's illness, these medications are also utilized. These medications are safe and natural; that is, they have no harmful side effects. Synthetic medications do not treat or permanently heal diseases; herbal drugs do. Natural herbs, as well as fruit and vegetable extracts, are used in herbal formulations to treat a variety of illnesses with no side effects. Chemical medications, on the other hand, are synthesized and have adverse effects. In comparison to allopathic drugs, herbal formulations are less expensive. Herbal remedies are environmentally benign (Fig. 1). Natural products are used to create herbal formulations, whilst chemically and chemically modified natural products are used to create allopathic medicines. Prescriptions are required for allopathic drugs; however, herbal formulations can be obtained without one (Kumar *et al*., 2014; Galor *et al*., 2011).

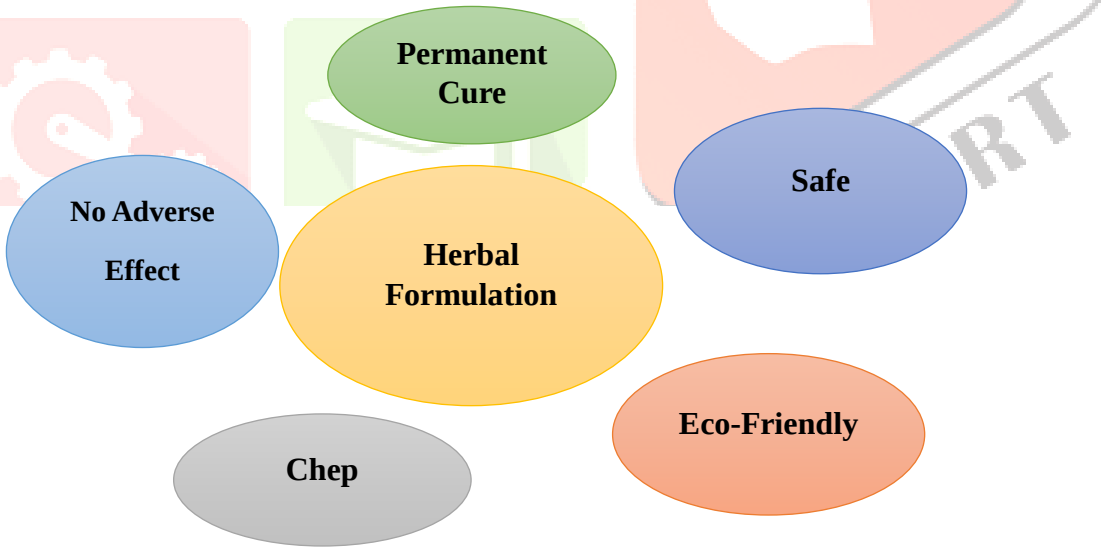

Fig 1: Advantages of Herbal Formulation

Clinical research has proven that extracts from medicinal plants have anti-diabetic properties and help restore the function of pancreatic β-cells (Gupta *et al*., 2008). Many examples of plants used for blood sugar regulation and diabetes management can be found in various parts of the world. These include *Abelmoschus moschatus* Medik (Malvaceae), *Acacia arabica* (Lam) Wild. (Mimosaceae), *Achyranthes aspera* L (Amaranthaceae), *Acosmium panamense* Schott. (Leguminosae), *Allium cepa* L. (onion): (Liliaceae), *Allium sativum* L. (garlic):
(Liliaceae), *Annona squamosa* L (Annonaceae), *Artemisia herba-alba* Asso (Med). (Asteraceae), *Astragalus membranaceus* Bunge (Fisch.) Leguminosae, *Bauhinia candicans* Benth (Leguminosae), *Bauhinia forficate*

Link. (Caesalpinaceae), *Bidens pilosa* L (Asteraceae), *Biophytum sensitivum* (L) DC. (Oxalidaceae), *Bixa orellana* L. (Bixaceae), *Brassica nigra* (L). Several components participate in controlling sugar in patients with diabetes such as phenolic and alkaloid compounds (Fig 2) (Uuh-Narvaez *et al.*, 2021)

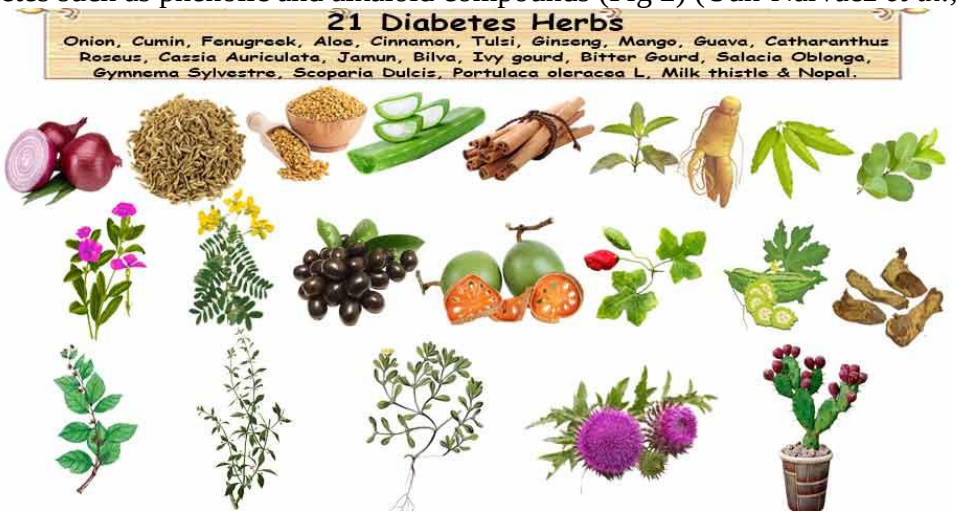

Fig 2: Diabetes Herbs and plants

***Allium cepa* (Onion):** Herbal medicines such as *Allium cepa*, or red onion, have been used traditionally to lower blood sugar levels and lessen the difficulties associated with diabetes. Preliminary research by Mathew and Augusti (1975) suggests that taking *Allium cepa* (onion) orally can help diabetics with glucose control. *A. cepa* was also found to have an immediate hypoglycemia effect in self-controlled research including twenty T2D patients. Additionally, two hours after ingesting glucose, it reduced (by 37%) the rise in plasma glucose (Myint *et al*., 2009).

Fig 3: *Allium cepa*

***Allium sativum* (Garlic):** Garlic, or *Allium sativum* L., is a member of the Allium genus in the Alliaceae family. Its therapeutic properties are attributed to a high concentration of non-protein sulfur amino acids, which are present in this species (Ovesna *et al*. 2015). Streptozotocin-induced diabetic Wistar rats showed improved regulation of antioxidant status in their blood and cardiac tissues after receiving treatment with fresh garlic homogenate (250 mg/kg b.w.) for six weeks (Naderi *et al*., 2015).

Fig 4: *Allium sativum*

***Momordjca charantia* (Karela):** *Momordica charantia*, also known as Karela, Ampalaya, bitter melon, and bitter gourd, has gained recognition for its ability to effectively manage diabetes. *Momordica charantia's* momordic I and momordic II, as well as cucurbitacin B, are its active ingredients. Diabetes is treated using it. It is composed of lectin, which functions similarly to insulin. Lectin is a non-protein that binds to insulin receptors. By interacting with peripheral tissues, this lectin lowers blood sugar levels (Khan *et al*., 2017). *M. charantia* fruit extract has hypoglycemic action at 200 mg/kg.

Fig 5: *Momordjca charantia*

***Azadirachta indica* (Neem):** Neem, a member of the Meliaceae family, is the term used locally for it. It can be found in Burma and India (Malvi *et al*., 2011). When taken in large quantities, Azadirachta indica ethanolic and aqueous extract lowers blood glucose levels. When allopathic medications alone are not sufficient to control type 2 diabetes, they can be used in conjunction with them (Rahimi *et al*., 2015). By widening blood vessels, its extract increases blood circulation and lowers blood glucose levels in the body (Mishra *et al*., 2011).

Fig 6: *Azadirachta indica*

***Ocimum sanctum* (Tulsi):** It's a member of the Labiateae family and is referred to as tulsi. It is extensively distributed throughout India. It is used to cure a variety of illnesses in Indian Ayurvedic medicine. An aqueous extract of *Ocimum sanctum* leaves (200 mg/kg) had hypoglycemic action in rats caused by streptozotocin, as demonstrated by several animal experiments. Additionally, according to Kumar *et al*. (2015), it is used to cure tumours, treat fungal infections, treats viral infections, lower stress levels, and treat gastric ulcers.

Fig 7: *Ocimum sanctum* (Tulsi)

***Catharanthus roseus Linn* (Nayantara):** In conventional medicine, *Catharanthus roseus* is a significant Ayurvedic drug. For the treatment of diabetic mellitus, it may be utilized in nations like Malaysia, China, South Africa, and India. *Catharanthus roseus* Linn. is a member of the Apocynaceae family and is referred to locally as Nayantara. It is said that the entire plant, particularly the leaves, has anti-tumor and antidiabetic qualities (Majumder *et al*., 2019).

Fig 8: *Catharanthus roseus*

***Syzygium cumini (L.)* Jamun:** *Syzygium cumini* is a member of the Myrtaceae family of plants, popularly known as Java plum and locally known as Kalojam. The plant's bark and seeds are used to treat diabetes, diarrhoea, and wounds (Rahman *et al*., 2013). According to Chhikara *et al*. (2018) and Bandiola *et al*. (2018), the plant is made up of bioactive phytoconstituents such as tannins, flavonoids, carotenoids, glycosides, saponins, steroids, triterpenoids, anthocyanins, phenols, oxalic acid, phytosterols, myricetin, gallic acid, etc. that give it anti-inflammatory, antibacterial, antioxidant, hypoglycemic, and hypolipidemic qualities.

Fig 9: *Syzygium cumini*

***Trigonella foenum graecum* (Fenugreek):** The fenugreek seed is a ubiquitous plant in India and is typically utilized as a primary ingredient in Indian spices. A new amino acid found in fenugreek seeds called 4-hydroxyleucine enhanced the secretion of insulin in both human and rat-isolated islet cells when stimulated by glucose (Sauvaire *et al*., 1998). Neelakantan *et al*. (2014) revealed that the fruit's ability to lower fasting blood glucose levels and improve glucose tolerance in human subjects makes it an effective antidiabetic. According to Roberts *et al*. (2011), fenugreek is being marketed as a nutraceutical that lowers hyperglycemia.

Fig 10: *Trigonella foenum graecum*

***Murraya koenigii* (Curry tree):** The traditional Indian medical system known as Ayurveda uses nearly every element of this plant in its treatment of a wide range of ailments. These components consist of the roots, bark, fruits, and young leaves of the plant. Curry leaves may be useful in the management of diabetes. Additionally, it supports liver and cardiac function. According to Mapalana *et al*. (2015), 10% curry leaves are administered together with a high-fat diet to inhibit the production of free radicals and keep the tissues at normal levels. Curry leaves are rich in vital minerals including iron, copper, and zinc that help to keep blood glucose levels within normal ranges (Azmin, 2016). Curry leaves were discovered to possess anti-diabetic qualities. Blood glucose levels have been demonstrated to be lowered by the fresh juice of *M. koenigii* leaves. Furthermore, a study involving healthy Wistar rats, extends the therapeutic efficacy of insulin, which improves its effect (Kamakshi *et al*., 2015).

Fig 11: *Murraya koenigii*

***Mangifera indica* (Mango tree):** *Mangifera indica*, a plant belonging to the Anacardiaceae family, is referred to as mango in general and as aam in the local language. According to Rahmatullah *et al*. (2010), the herb has been used to cure diabetes, edema, and dysentery in addition to acting as an antidote to poison. It is widely utilized in Ayurvedic treatment and is native to tropical Asia. The plant contains the antioxidant polyphenol mangiferin and the hypotensive, antidegenerative, and anti-diabetic glucosyl xanthone (Shah *et al*., 2010). Xanthones, phenolic acids, and flavonoids are the phytoconstituents that are most prevalent in the plant. According to Ediriweera *et al*. (2017), the plant contains a variety of major polyphenolic compounds, such as gallic acid, catechins, kaempferol, ellagic acids, anthocyanins, and ascorbic acid; carotenoids, such as luteoxanthine, zeaxantine, and b-carotene; terpenoids, such as careen, myrcene, and terpinoline; and saponins, such as indicoside A and B.

Fig 12: *Mangifera indica*

Conclusion: More than 300 million people worldwide suffer from diabetes mellitus, the most prevalent endocrine illness. Because of this, treatments created using allopathic medicine, which is based on Western medical concepts, frequently have low efficacy, a high risk of side effects, and are prohibitively expensive, particularly for developing nations. So, it makes a lot of sense to treat diabetes mellitus with readily available, plant-derived chemicals rather than requiring time-consuming pharmaceutical extraction. Herbal remedies are much more potent than synthetic anti-diabetic medications, and their side effects are much less severe. Given its efficacy, accessibility, and reasonable cost, plant medicine has the potential to establish itself as a recognized alternative treatment in India. To fully utilize the potential of these plants for use in the management of diabetes mellitus, more research and studies are strongly recommended.

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References:

1. Grover J.K., Yadav S., Vats V. Medicinal plants of India with antidiabetic potential. *J. Ethnopharmacol.* 2002; 81:81100
2. Scartezzini P., Sproni E. Review on some plants of Indian traditional medicine with antioxidant activity. *J. Ethnopharmacol.* 2000; 71:23–43
3. Seth S.D., Sharma B. Medicinal plants of India. *Indian J. Med. Res.* 2004; 120:9–11.
4. Viswanathan V, Rao VN. Problems associated with diabetes care in India. *Diabetes Manag.* 2013;3(1):31–40. doi: 10.2217/dmt.12.62.
5. Modak M, Dixit P, Londhe J, Ghaskadbi S, Paul A, Devasagayam T. Indian herbs and herbal drugs used for the treatment of diabetes. *J Clin Biochem Nutr.* 2007;40(3):163–173. doi: 10.3164/jcbn.40.163.
6. ISHIHARA Eriko, MIURA Toshihiro, SHINYA Nobuko, USAMI Masaru. Effect of the water extract of perilla leaves on glucose metabolism in diabetic rats. Suzuka University of Medical Science, Bulletin. 2005; 12: 79-84
7. Yu Zengyang, Gong Chenyuan, Lu Bin, Yang Li, Sheng Yuchen, Ji Lili, Wang Zhengtao. Dendrobium chrysotoxum Lindl. alleviates diabetic retinopathy by preventing retinal inflammation and tight junction protein decrease. Journal of diabetes research. 2015; 2015
8. M. Das, B.P. Sarma, A.K. Khan, M. Mosihuzzaman, N. Nahar, Ali L., A. Bhoumik, B. Rokeya. The antidiabetic and antilipidemic activity of aqueous extract of Urtica dioica L. on type2 diabetic model rats. Journal of Bio-Science. 2009; 17: 1-6.
9. Prabhakar PK, Doble M. Mechanism of action of natural products used in the treatment of diabetes mellitus. Chin J integr med;2011(17).
10. Kumar K, Fateh V, Verma B, Pandey S. Some herbal drugs used for treatment of diabetes: review article. International. vol. 2014

11. Galor SW. Benzie IF. F Herbal medicine: an introduction to its history, usage, regulation, current trends and; Research needs.2011.
12. Gupta R. Bajpai KG, Johri S, Saxenaa M. An overview of Indian novel traditional medicinal plants with antidiabetic potentials. Complementary and Alternative. Medicines;2008(5):1–17.
13. Uuh-Narvaez JJ, Segura-Campos MR. (2021) Cabbage (*Brassica oleracea* var. capitata): A food with functional properties aimed to type 2 diabetes prevention and management. *J Food Sci* 86:4775-4798. doi: 10.1111/1750-3841.15939. Epub 2021 Oct 17. PMID: 34658044. https://doi.org/10.1111/1750-3841.15939.
14. MATHEW, P.T.; AUGUSTI, K.T. Hypoglycaemic effects of onion, allium cepa linn. on diabetes mellitus - a preliminary report. *Indian J. Physiol. Pharmacol.*, v.19, p.213-217, 1975.
15. MYINT, Z.; HTUN, H.L.; THWIN, T.; MAR, T.T.; NEW, M.M.; OO, A.M.; MAW, L.Z.; OO, T.K.K.; KYAW, M.T. Acute effect of onion (*Allium cepa*) on blood glucose level of diabetic patients. *Myanmar Health Sci. Res.*, v.21, p.22- 25, 2009.
16. Ovesna J, Mitrová K, Kučera L (2015) Garlic (*A. sativum* L.) alliinase gene family polymorphism reflects bolting types and cysteine sulphoxides content. BMC Genet 16:53. https ://doi.org/10.1186/ s1286 3-015-0214-z
17. Naderi R, Mohaddes G, Mohammadi M, Alihemmati A, Badalzadeh R, Ghaznavi R, Ghyasi R, Mohammadi S (2015) Preventive effects of garlic (*Allium sativum*) on oxidative stress and histopathology of cardiac tissue in streptozotocin-induced diabetic rats. Acta Physiol Hung 102:380–390. https ://doi.org/10.1556/036.102.2015.4.5
18. Khan Y. Aziz I, Bihari B, Kumar H, Roy M, Verma VK. A Review- Phytomedicines Used in Treatment of Diabetes. Asian Journal of Pharmaceutical research; 2014: 4–3.
19. Malvi R, Jain S, Khatri S, Patel A, Mishra S. A Review on Antidiabetic Medicinal Plants and Marketed Herbal Formulations mulations. International Journal of Pharmaceutical & Biological Archives;2011(2):1344–1355.
20. Rahimi M. A Review: Anti Diabetic medicinal plants used for diabetes mellitus. Bulletin of environmental, pharmacology and life. sciences;2015(4):163–180.
21. Mishra R, Shuaib M, Shravan M, S P. A review on herbal antidiabetic drugs. Journal of Applied Pharmaceutical Science2011;1(6):235–237.
22. Kumar D, Trivedi N. Dixit RK. Herbal medicines used in the traditional indian medicinal system as a therapeutic treatment option for diabetes management: A review. World Journal of Pharmacy and Pharmaceutical Sciences2015; 4(4)
23. Majaz, A.Q.; Khurshid, M.; Nazim, S. The miracle plant (Kalanchoe pinnata): A phytochemical and pharmacological review. Int. J.Res. Ayurveda Pharm. **2011**, 2, 1478–1482
24. Rahman, A.H.; Biswas, M.C.; Islam, A.K.; Zaman, A.T. Assessment of traditional medicinal plants used by local people of monirampur thana under Jessore district of Bangladesh. Wudpecker J. Med. Plans **2013**, 2, 99–109.

25. Chhikara, N.; Kaur, R.; Jaglan, S.; Sharma, P.; Gat, Y.; Panghal, A. Bioactive compounds and pharmacological and food applications of Syzygium cumini—A review. Food Funct. **2018**, 9, 6096–6115.
26. Bandiola, T.M.; Ignacio, G.B.; Yunson, E.G.; Bandiola, P.D. Syzygium cumini (L.) skeels: A review of its phytochemical constituents, toxicity studies, and traditional and pharmacological uses. Int. J. Appl. Pharm. Biol. Res. **2017**, 2, 15–23
27. Neelakantan N, Narayanan M, de Souza RJ, van Dam RM. Effect of fenugreek (Trigonella foenum-graecum L.) intake on glycemia: a meta-analysis of clinical trials. *Nutr J.* 2014; **13**:7. doi: 10.1186/1475-2891-13-7.
28. Roberts KT. The potential of fenugreek (Trigonella foenum- graecum) as a functional food and nutraceutical and its effects on glycemia and lipidemia. *J Med Food.* 2011; **14**:1485–1489. doi: 10.1089/jmf.2011.0002.
29. Mapalana, Kamburupitiya, Sri Lanka. Current Status and Future Prospect of Curry (Murraya koenigii) Leaves in South Asia, Journal of Agri Search (2015)2(3):212-216, ISSN: 2348-8808
30. Azmin Tara porewala, curry leave powder August 3, 2016, Available from
31. Kamakshi U. N., Rao D. S., Suvarchala K. Y., Anusha K., Rao B. V. Comparative hypoglycemic study of aloe vera, Murraya koenigii and Azadirachta indica. *International Journal of Pharmacognosy and Phytochemical Research.* 2015; 7:923–927
32. Sauvaire, Y., Petit, P., Broca, C., Manteghetti, M., Baissac, Y., Fernandez-Alvarez, J., Gross, R., Roy, M., Leconte, A., Gomis, R., and Ribes, G.: 4-hydroxyisoleucine: a novel amino acid potentiator of insulin secretion. Diabetes, 47, 206–210, 1998
33. Rahmatullah, M.; Mollik, M.A.H.; Khatun, A.; Jahan, R.; Chowdhury, A.R.; Seraj, S.; Hossain, M.; Nasrin, D.; Khatun, Z. A survey on the use of medicinal plants by folk medicinal practitioners in five villages of Boalia sub-district, Rajshahi district, Bangladesh.Adv. Nat. Appl. Sci. **2010**, 4, 39–44.
34. Shah, K.; Patel, M.; Patel, R.; Parmar, P. Mangifera indica (Mango). Pharmacogn. Rev. **2010**, 4, 42–48.
35. Ediriweera, M.K.; Tennekoon, K.H.; Samarakoon, S.R. A Review on Ethnopharmacological Applications, Pharmacological Activities, and Bioactive Compounds of Mangifera indica (Mango). Evid-Based Complement. Altern. Med. **2017**, 2017, 6949835. [CrossRef] [PubMed]